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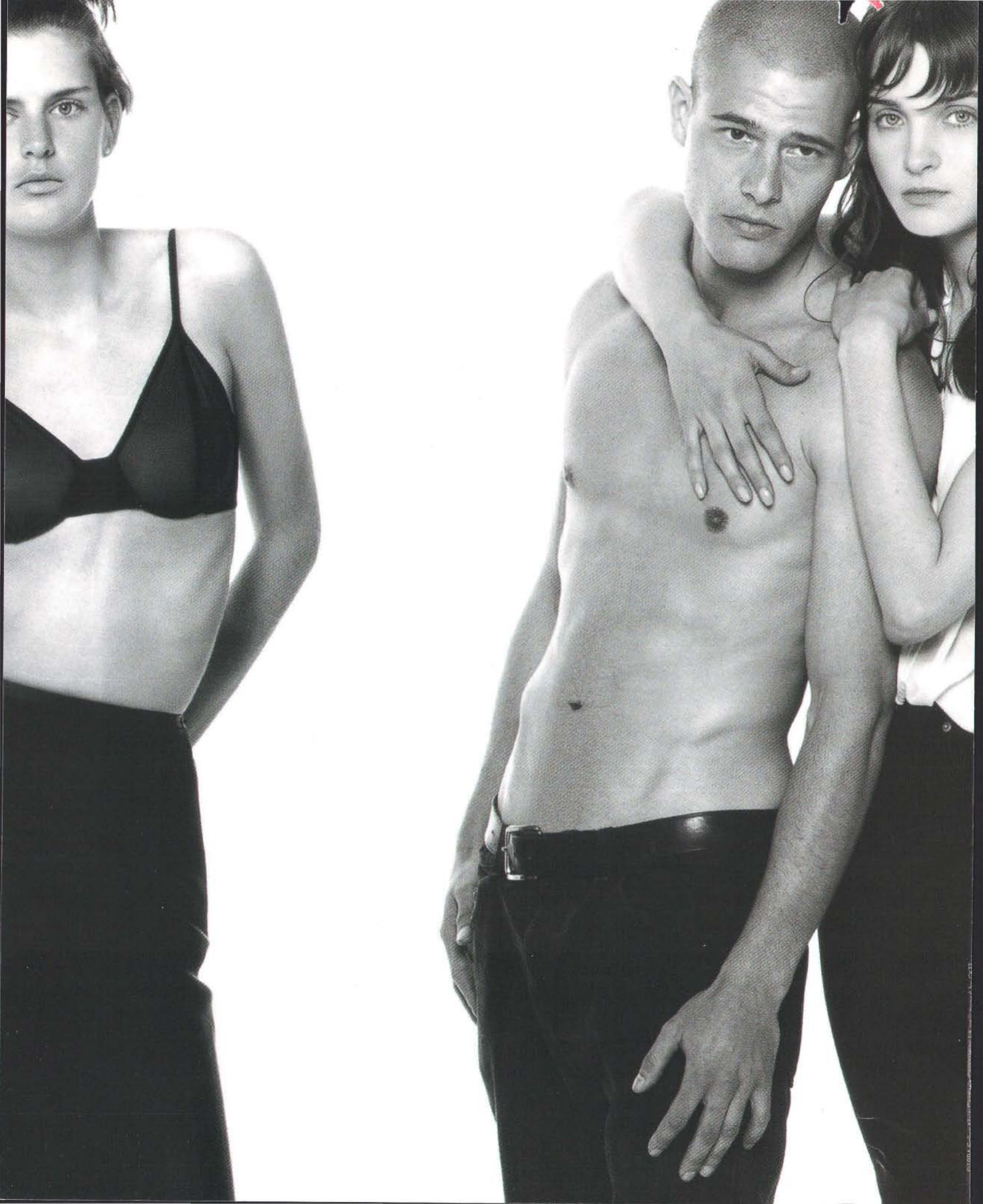

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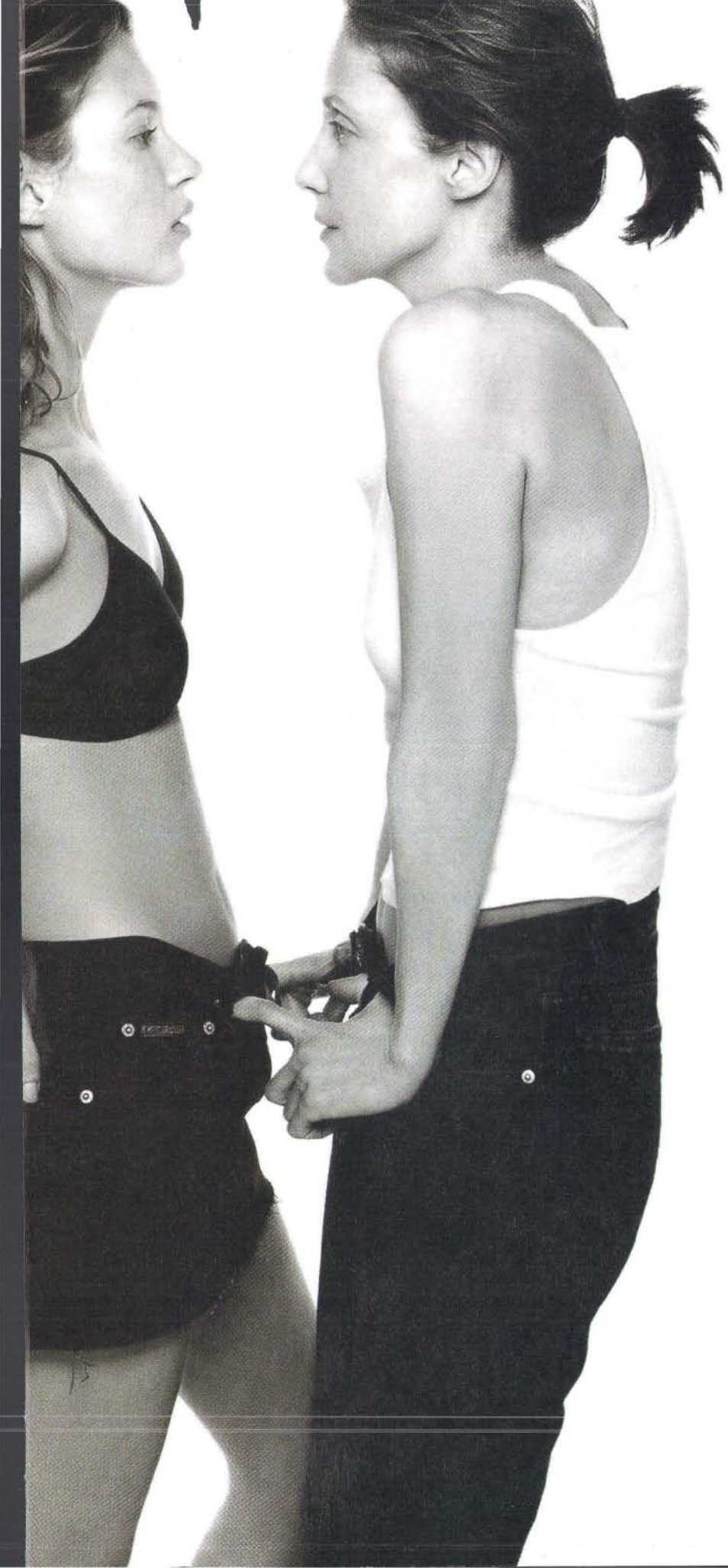

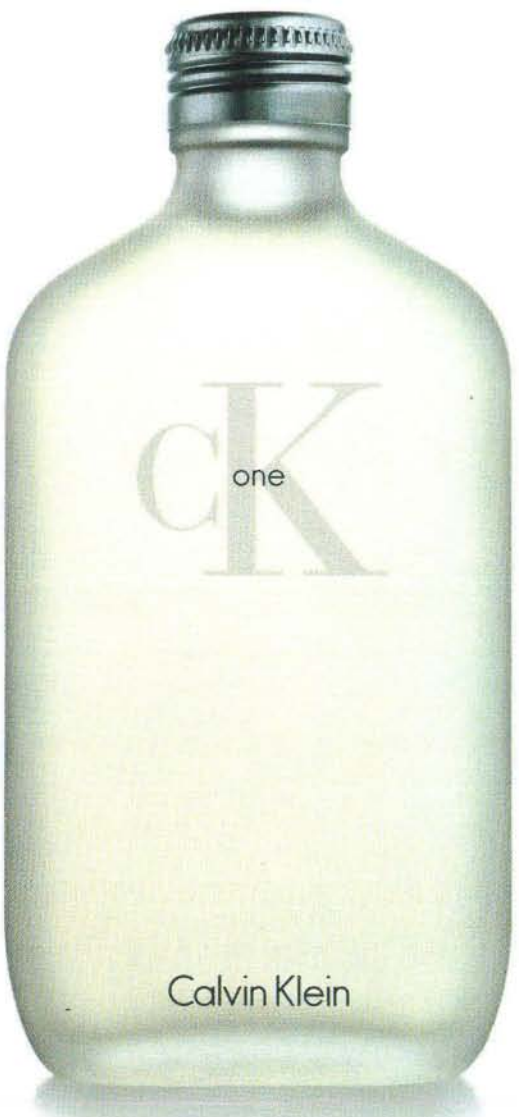

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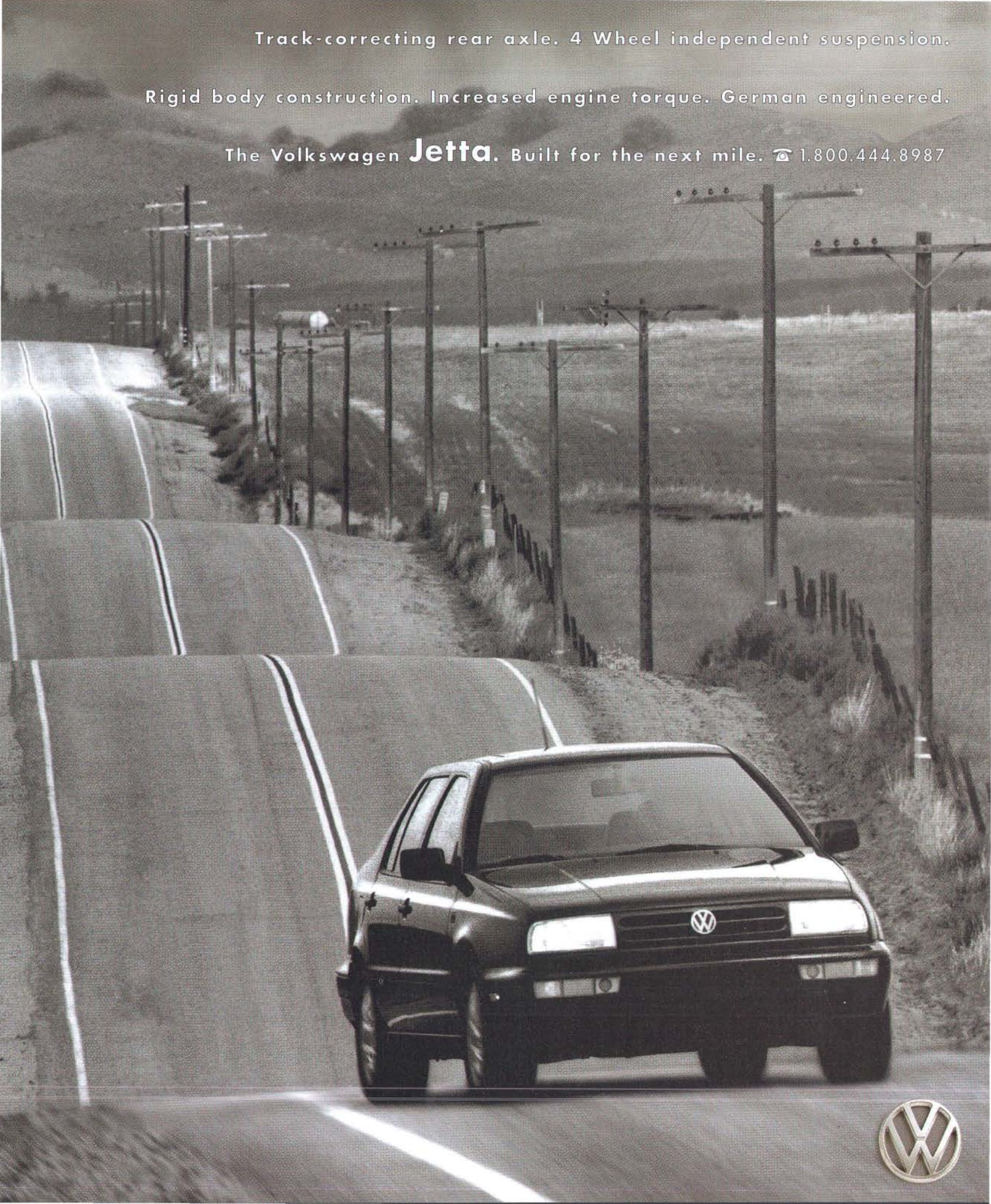
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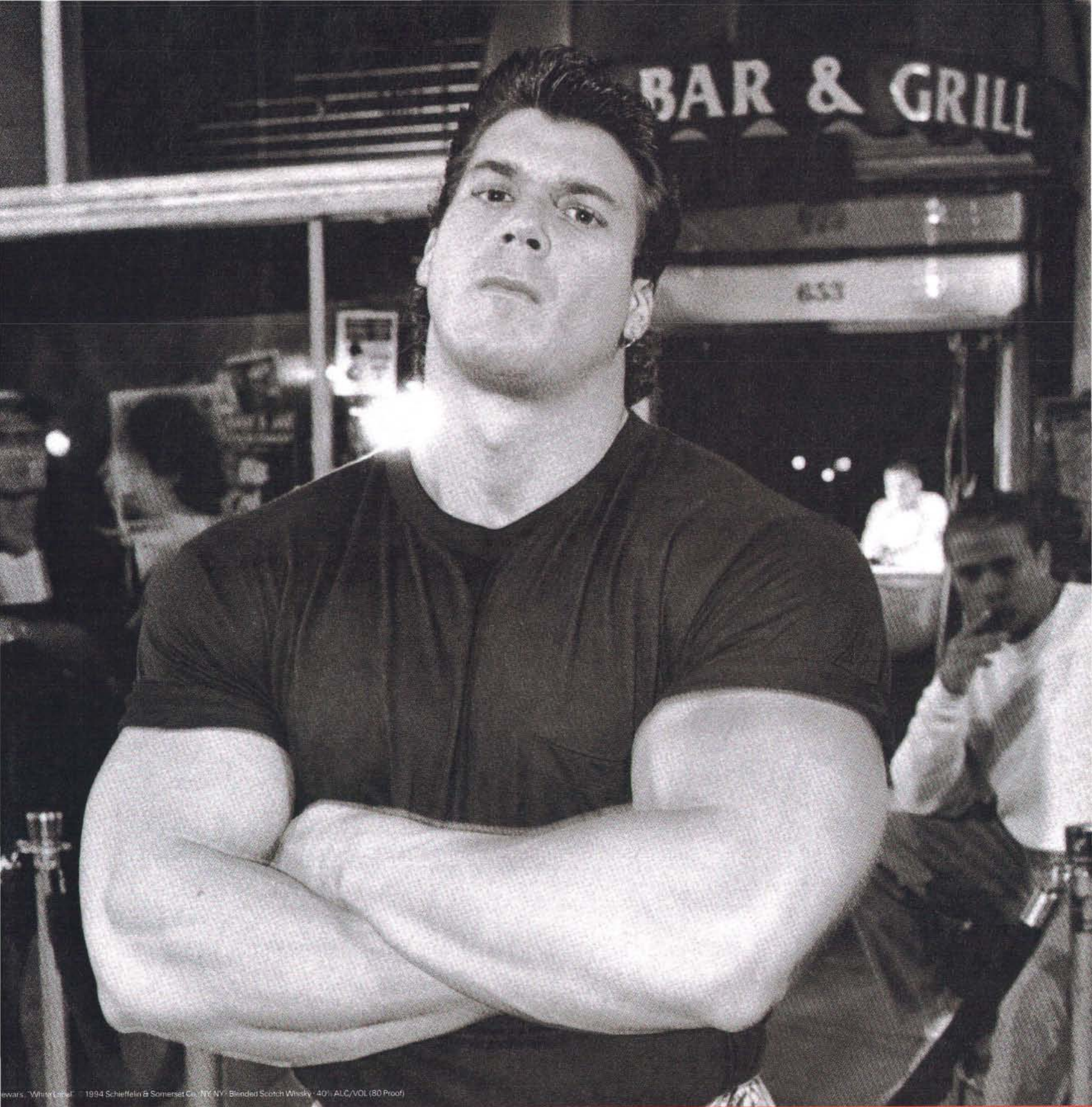

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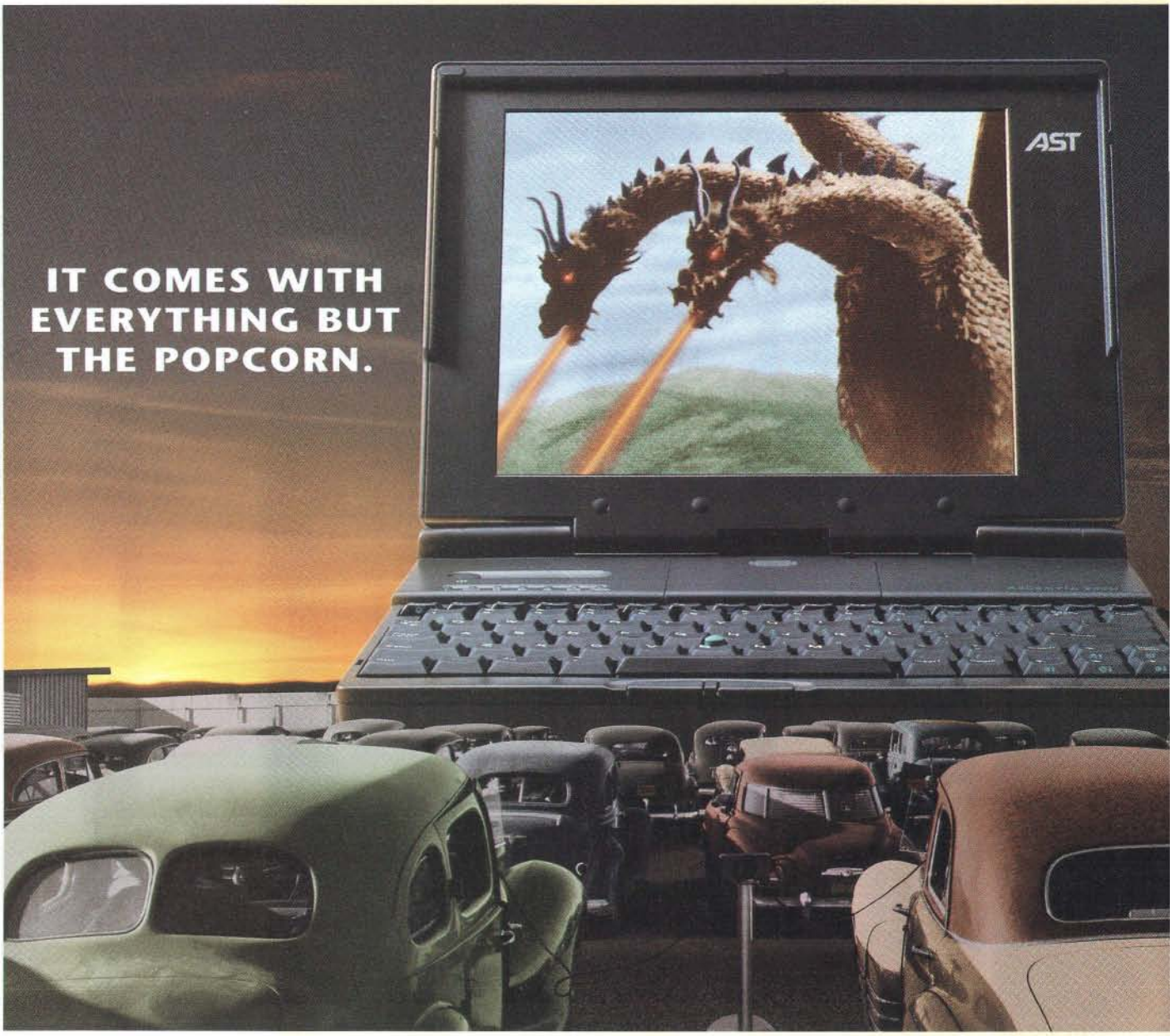

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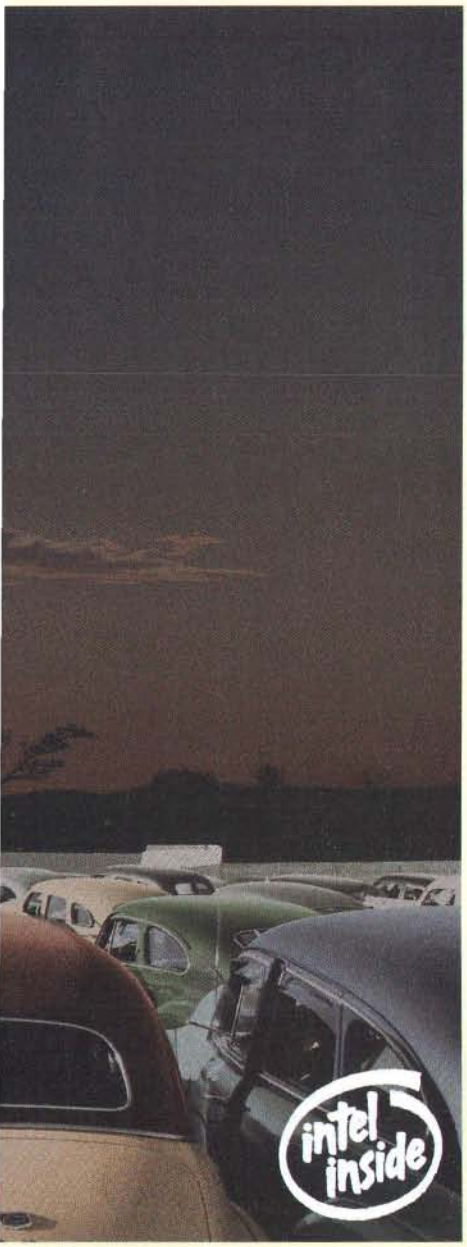

	AST 900N	IBM 755C,Cs	COMPAQ LTE ELITE	TOSHIBA T4800CT
Screen	10.4" TFT 10.3" DS-STN	10.4" TFT 9.5" DS-STN	9.5" TFT	9.5" TFT
Battery Life	4-8hrs	3.1-8hrs	2.5-4hrs	2.5-4hrs
Pointing Device	Integrated Trackstick	Integrated Trackpoint	Integrated Trackball	External Trackball

Intel DX4/75MHz comparable products as of 6/13/94. Screen measured diagonally. Battery life from manufacturers' specifications.

900N than just an eye-popping screen. This is very much a high performance notebook, with a powerful Intel 486 processor, up to 75MHz. Local bus architecture combined with hardware accelerated graphics deliver as much as 16 million WinMarks.

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In fact, everything you need to be truly mobile is right here. For instance, the pointing stick is right at your fingertips. There are two PCMCIA slots. Or, if you prefer, you can add a docking station for more expansion.

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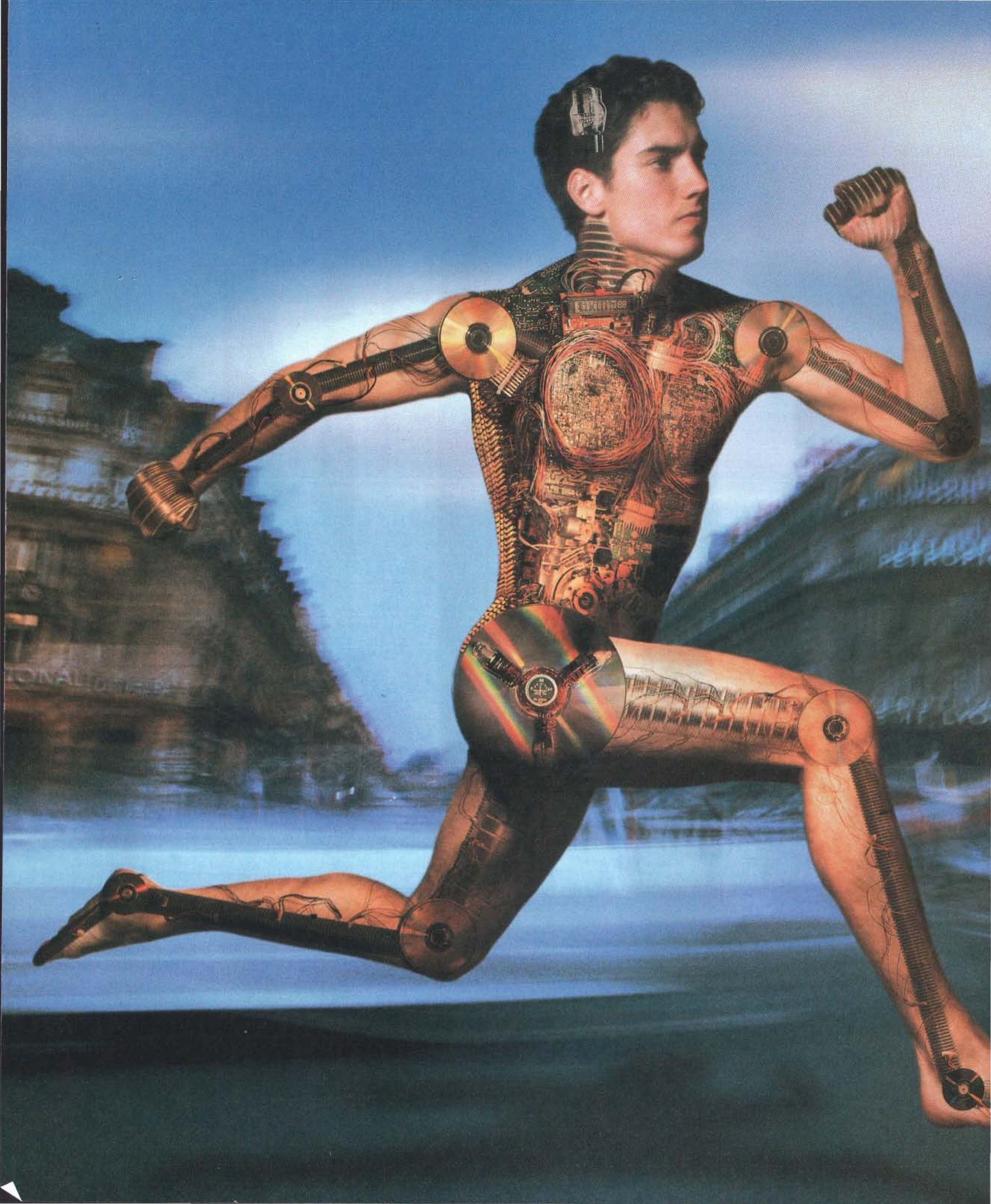

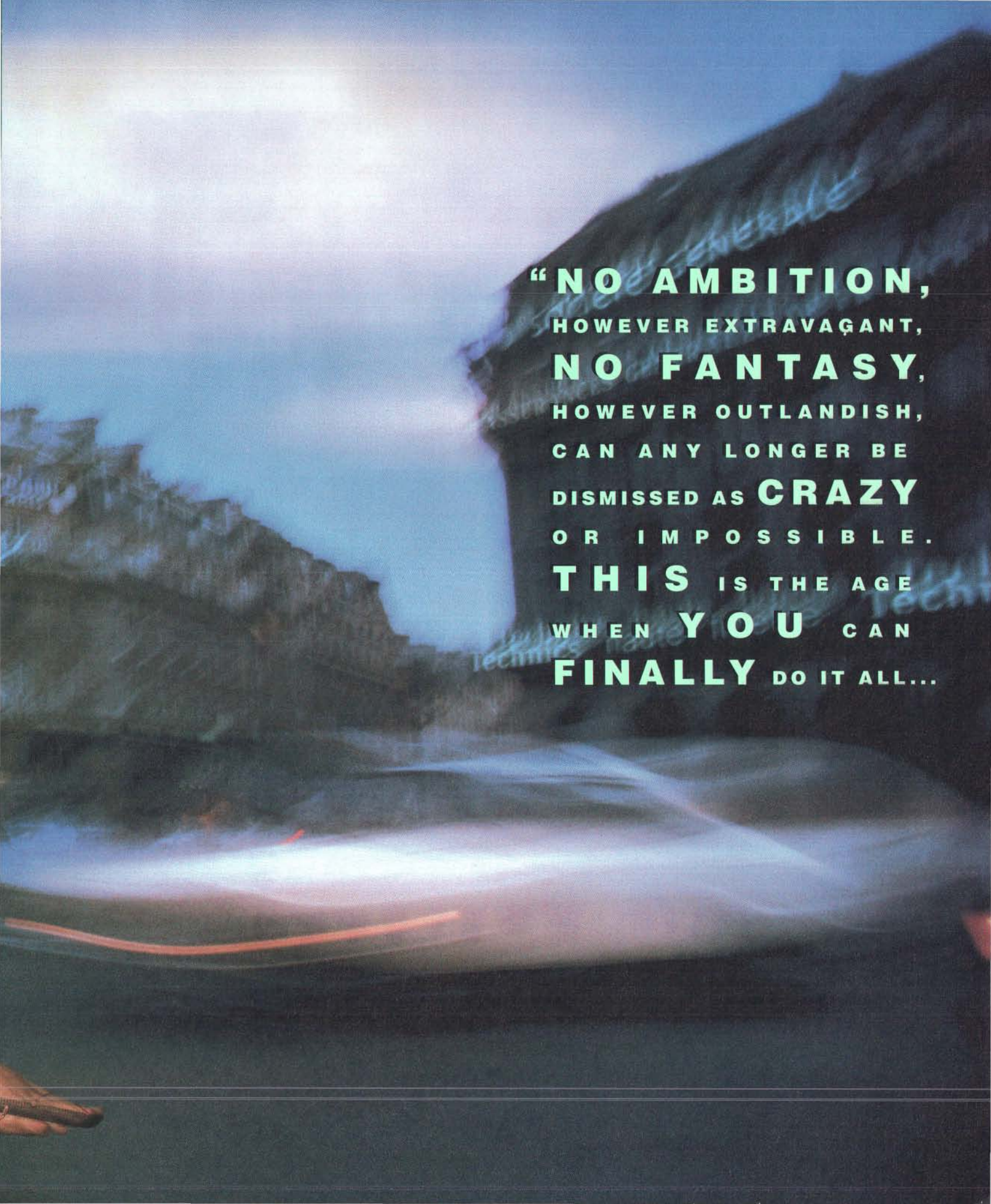
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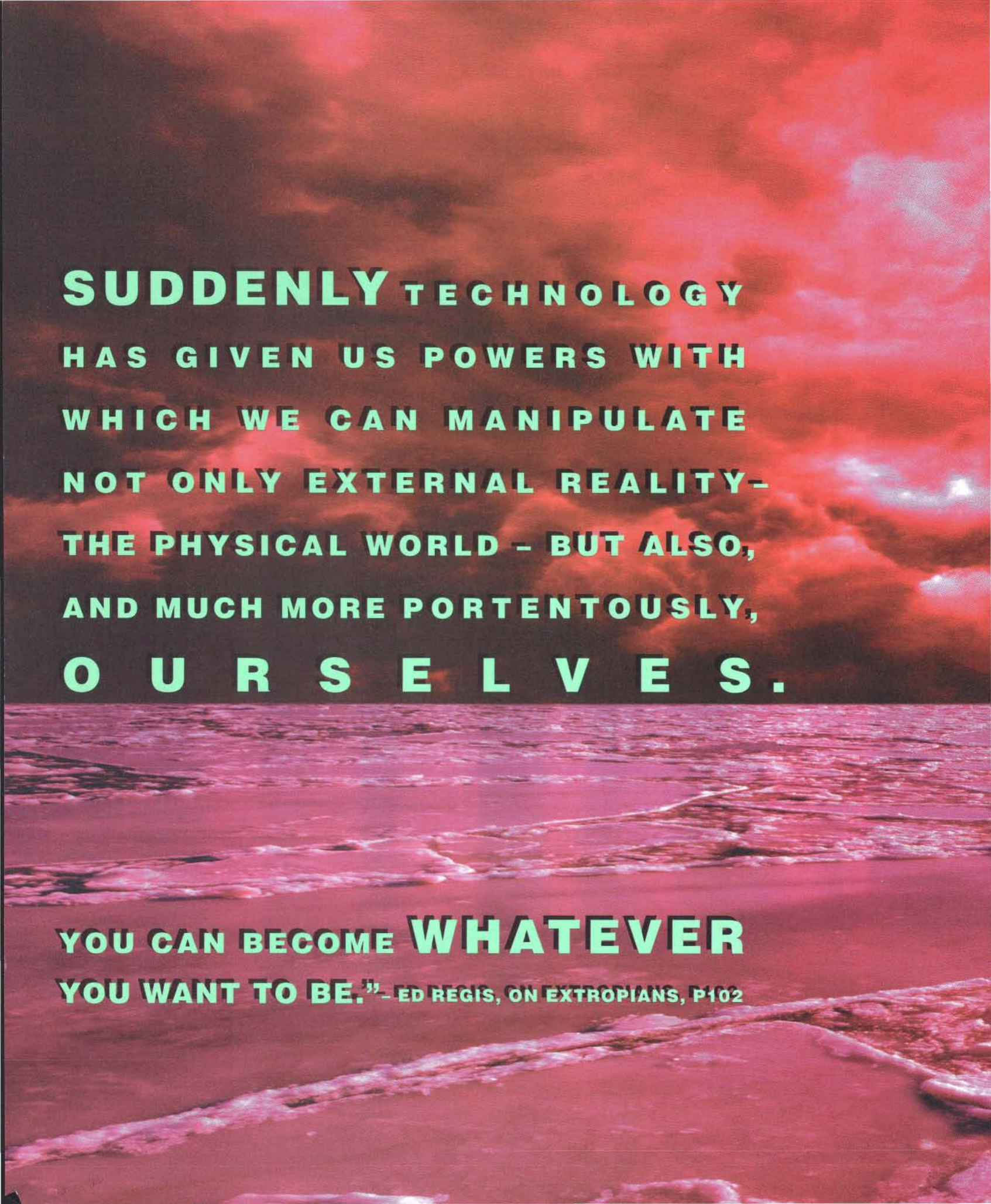
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YOU WANT TO BE."– ED REGIS, ON EXTROPIANS, P102

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Cover: Neal Stephenson photographed by Karen Moskowitz, July 1994, Seattle.
Introduction: Jim Porto. Running man: Mars Safrogelev. Bald screamer: Jeff Rigby. Sculpture of barbed-wire head: Scott Siken
Greek translation courtesy of International Contact Inc.

Sure, landing a TV movie or guesting on a talk show would be nice. But Michele Smith is happy to be known for that fraction of a second in which an airbag deploys and maybe she's helped save a life.

Michele has been one of our safety engineers for eight years now. Even before there was a Saturn car, there were Saturn people like her. Designing. Testing. Thinking. Then testing some more.

That's the way you dream up things like, oh, patent # 4,893,874 —the latchplate on our rear seat-belts that Michele helped design. Or even a little bigger project she happened to be part of—the dual airbags on the new Saturn.

Michele and her team wanted not only an additional airbag but additional advances. A centralized sensing system for knowing exactly when to deploy the bags. And a new contour—on an all-new dash—to hold the passenger bag in position.

While the rest of us expect to be famous for at engineer Michele Smith is quite

She doesn't always get the credit for making a Saturn safe, but Michele isn't complaining. She knows Saturn really is a team. And besides, just look at that ritzy crowd she gets to hang out with over there.

Just a few members of the airbag development team. Michele's the one on the left there.

Every Saturn features "crumple zones," shoulder harnesses, available anti-lock brakes, and now, dual airbags like the ones shown here. But don't be fooled by looks. Airbags aren't fluffy pillows.

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They're a supplemental restraint system (always wear your seatbelts, even with airbags) that deploys rapidly. Of course, engineers like Michele Smith would be happy if you never get to see our airbags at all. They're not all that hung up on fame, anyway.

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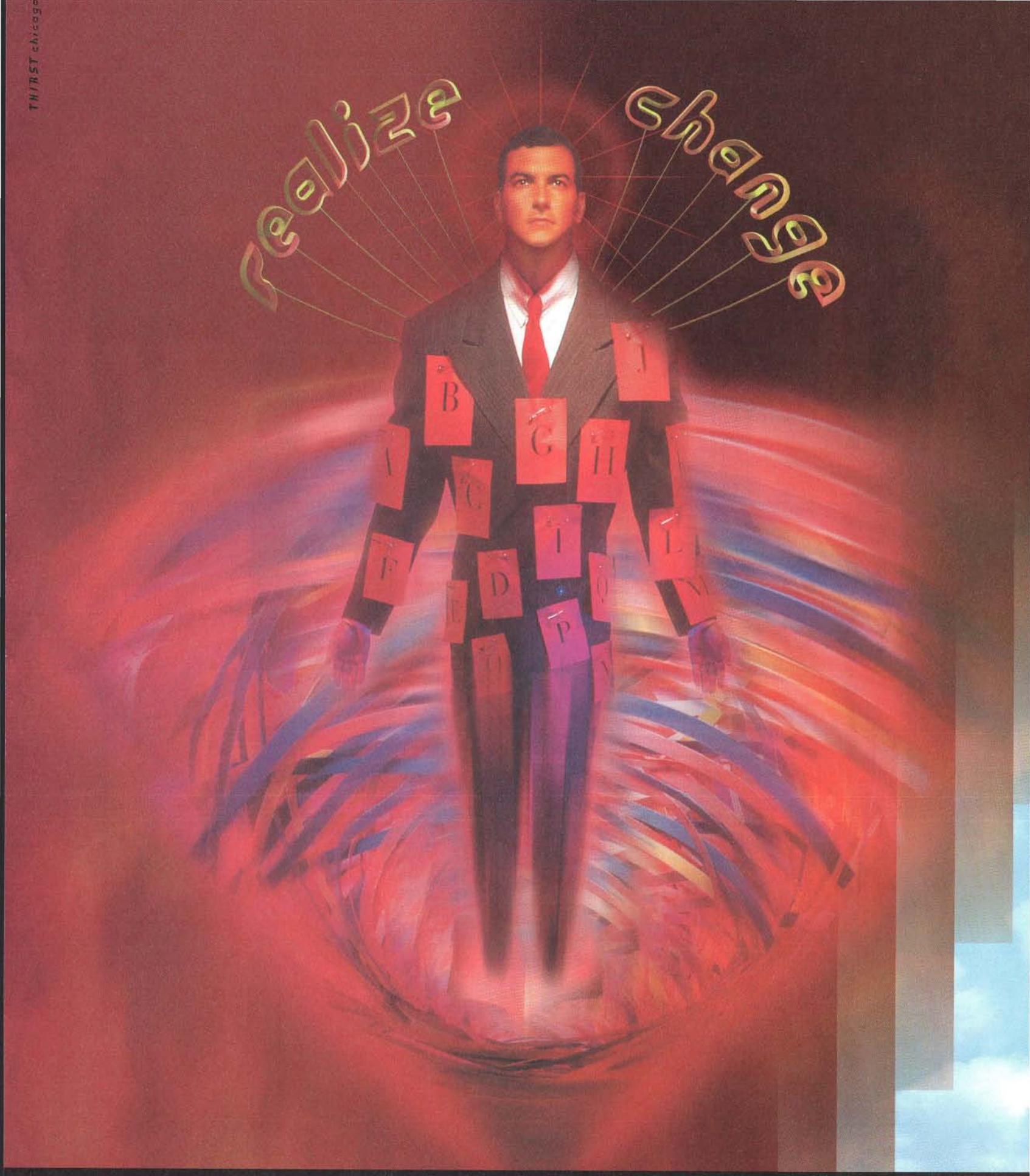

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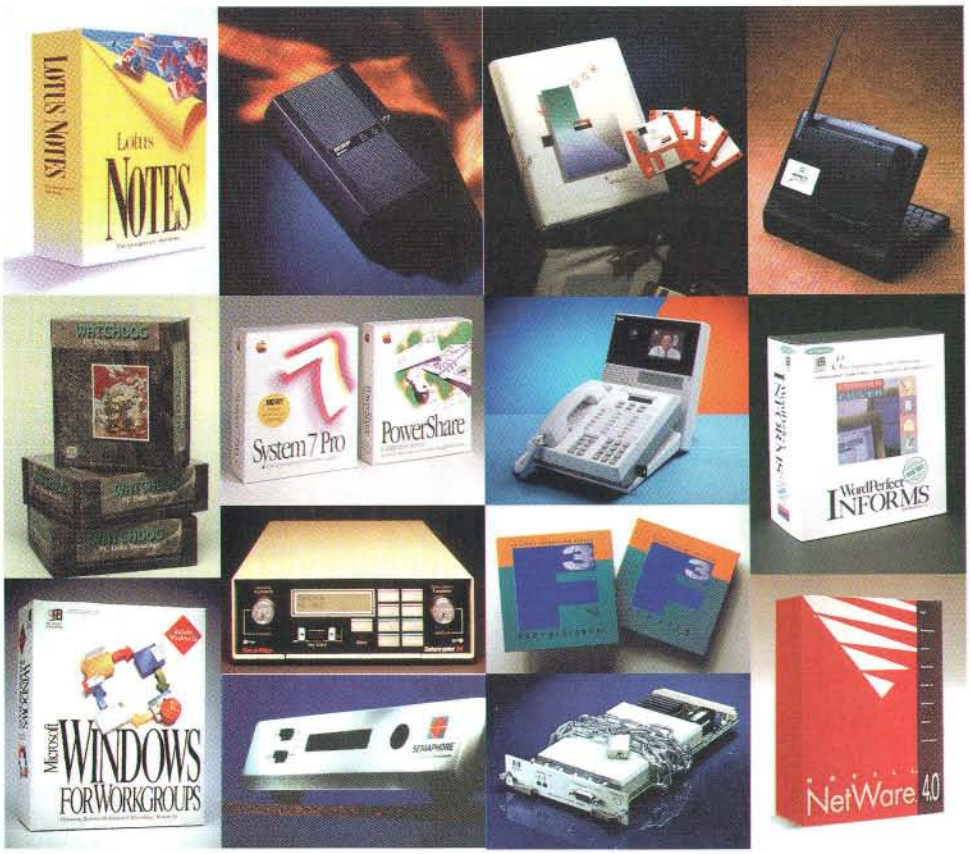

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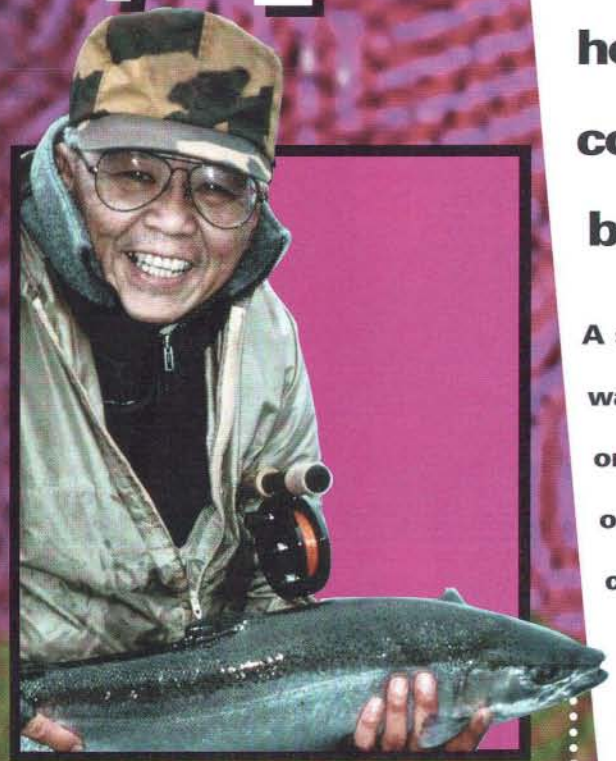

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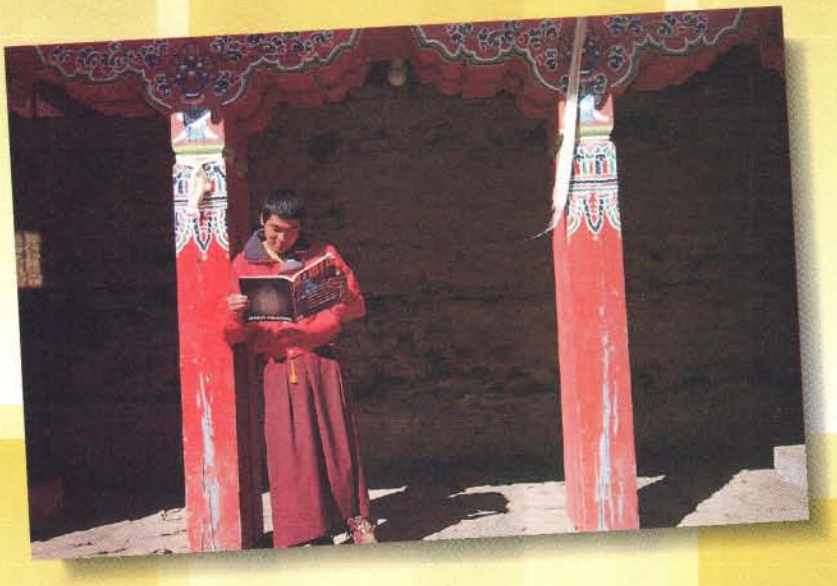
The Lone Malone

John Malone is full of shit! ("Big Bad John," *Wired* 2.07, page 86.) TCI isn't powerful because it's a great company or because Malone's a great CEO. It's powerful because it doesn't compete! It doesn't give one damn about its customer base and makes no effort to serve it. Here in Seattle, the city is divided into two cable areas: live in one part of town, and you get cable from Viacom; live in the other, and you get it from TCI. They have a lock on the areas they serve. TCI employees have a we-don't-care-we-don't-have-to attitude which, I'm convinced, trickles down from Denver. TCI wouldn't last six months in a competitive environment. Malone's whining about the RBOCs and claiming political naïveté was laughable. *Wired*'s cover portrayal of Malone as road warrior was, I trust, parody. In another situation, the guy would be considered a racketeer, plain and simple.

James Eaton
JEaton@aol.com



One of the most incredible interviews I've ever read! Your "man on the scene," David Kline, deserves tremendous kudos for having either (a) prepared so well, or (b) known so much about the biz, because he was on Malone's wavelength. Kline wasted no time with fluff. It's rare (indeed, incredible!) to get such blunt talk about strategy among I-way warriors, or *any* corporate mucky-mucks. *Forbes* or *Business Week* should do so well with their coverage. Thanks for the mind food.

Matt Van Ryn
IthacaMatt@aol.com

Clipping Along

It's easy to see why Stewart A. Baker is chief counsel for the NSA. His mastery of lawyerly craft is evident in his article apologizing for escrow encryption. You can tell he is good because the article is riddled with subtle circumlocution and obfuscation.

When a lawyer resorts to such an artful creation, it is clear that he has no solid foundation on which to base his arguments. If his arguments were valid, they would have been stated directly and clearly. Instead, he devilishly charms us with humor, then characterizes all PGP users as pedophiles by association. First the smoke, then the mirrors.

Some clever lawyer, perhaps Baker himself, will someday use the same wordy and misleading techniques to charm out loopholes that will allow "legal" privacy abuse. I find it odd that he asks us to place confidence in the scheme by depending on the "safeguards approved by the attorney general" given the recent questionable practices in that office by Ed Meese and Dick Thornburgh.

A modern-day J. Edgar Hoover merely need invoke the chant, "It's in the best interest of national security," and the cache of decryption keys will be laid open like the coat of a peddler selling knockoff Rolexes on 42nd Street. Who knows what pervasive access the NSA itself would have?

Baker was right about one thing. Encryption can't protect me from data I surrender willingly, so please keep my identity confidential.

Name and e-mail address withheld

Out-Raged

The article by Mark Nollinger, "Rage," in issue 2.06 (page 102) is the worst piece of journalistic trash I have yet seen in *Wired*. Trash, because it is bait-and-switch sensationalism at its sleaziest.

The article starts by painting the main character, Alan Winterbourne, as normal, letting that normality stand in stark contrast to his sudden, impossible-to-predict murder spree and ultimate death.

But by the end of the article, we see that he was never normal, that his violence was in fact entirely predictable, that, like other mass murderers, he went nuts long before he killed.

Had the author presented these facts in chronological order, there would have been no supposed mystery, no average guy gone nuts. No story hook.

In other words, the story hook that was presented was entirely artificial – the product of selective ordering and careful omission.

This is an essentially dishonest story, and one that does not deserve to run in the pages of *Wired*. It is almost enough to make me cancel my subscription.

Thomas B. Cox
tcox@netcom.com

Schoolhouse Rock

In his article "Learning by Doing" (*Wired* 2.07, page 144), Nicholas Negroponte sounds like a man who had a rough time with – indeed a real hatred for – the social sciences when he was a kid. I do agree, for once, with him that learning involves passion and that a child's intellect must be stretched with creative pursuits as much as possible. But he can't be serious when he intimates that facts aren't important for them to know.

He states, "Most American children do not know the difference between the Baltics and the Balkans. So what?" So what??! I found it ironic that he should pick those two regions, countries which largely disappeared as distinct entities from the world map for the better part of the 20th century and which are back today with a vengeance. It would certainly behoove a child to look at a map from 1905 as compared to a current one and see that for the price of two world wars (the first started in the Balkans and the second gobbled up the Baltics), a cold war, several smaller hot ones, several totalitarian regimes,

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and many tens of millions of dead in the intervening century, European boundaries haven't changed very much. Considering recent events in Bosnia, Russia, and Germany, I think it safe to assume that neither have the people changed. But what does Negroponte see as the alternative to requiring children to remember names like Verdun, Stalingrad, Da Nang, Buchenwald, Selma, and their corresponding dates and geographical locations, to serve as a reference of what not to do when the next century is handed over to them? What will the coming generations do without being taught the facts to learn and live by? Repeat all our stupid mistakes because learning by doing was more fun and what went on before was deemed irrelevant or too much bother to learn? Perhaps they'll simply get bored with society and create paradise on a computer with newly designed frogs to inhabit it.

The Visigoths are back, Nick. They're just called Technocrats today. God help us if the batteries run out and the power goes off.

Elizabeth Forrest
5778898@mcimail.com

Let me simply say, I went to high school in Europe, speak three languages, have a home in the Balkans, and am happy to challenge anybody to a geography bee. Also, as an aside: the truth is that remembering facts comes from personal meaningfulness. I did not like history in school, but I can date almost anything in European history from art and architecture, not politics and wars. – Nicholas Negroponte

Dear Mr. Negroponte,

Great article in the recent edition of *Wired*. The title alone, "Don't Dissect the Frog, Build It" says it all ... everything from an ethical biological perspective to the essence of your writing: constructivism.

Have you read *The Myth of Educational Reform* by Popkewitz et al? It's a study of IGE schools and the classification of schools as constructivist, technical, and illusory. I am an area superintendent in a 23,000-student suburban district in Saint Louis, Missouri. Also, I am a student of reform, restructuring, change, kids, and professionals in general. Constructivism is truly a belief system that I accept and practice, though I avoid the label completely as it causes folks to line up either staunchly "for" or "against" it.

Your article hit home, and, I assure you, will be required reading for a set of principals with whom I work. Assuredly, they will construct their own meaning from it. (The piece just may cause me to subscribe to *Wired*.) Your words were refreshing and a welcomed sight to us educators who know that there are corporate types reading *Wired* too.

Jere Hochman
Clayton, Missouri

Dear Mr. Negroponte,

In your essay, you make the almost always neglected point that when our education system is criticized for not measuring up to, say, the Japanese or the French, what is being compared are test scores: education systems that produce students "whose brains have been stuffed with thousands of facts" are compared to a system that doesn't "stuff" – one that is so decentralized, so porous, that facts and students fall through the cracks. The "stuffed" will always score higher.

We should exhalt our porosity, our crazy quilt of local education systems. While they must improve their service to the poor, they are much better equipped to teach the skills needed to use computers, logic machines – and to create innovative software for these machines – than are those centralized, rigid systems, European and Asian, that essentially teach obedience and produce students (workers) who will color inside the lines, always. The really bright people from these systems often leave their native countries to work in the US, where they might create the breakthroughs that earn them their Nobel prizes.

Manufacturing requires repetition and tight control. Managers love to measure, to quantify, to meet production goals. They don't feel comfortable with ambiguity, with all the blind stabs it takes to "design the frog." As one of those students who initially fell through the education system, which would have been a fatal fall in either France or Japan, I value the "disorder" of a system that doesn't close itself to its clients, no matter their ages, their one-time test scores, or their ideas for strange frogs. Stay wired.

Don Brunn
d.brunn@genie.geis.com

You'll Shoot Your Eye Out

Thank you for your coverage of the Beeman/Feinwerkbau air guns in your June 1994 issue.

However, we were greatly disturbed by the fact that the author, Jef Raskin, suggested that it was acceptable to shoot these guns at an individual and do no more than "cause a welt." As is well known, the first rule of safe gun handling is never to point a gun, *any* gun, at a person. Second, these guns do have the capacity to cause serious damage, and yes, they can be lethal.

According to guidelines published by the American Society for Testing and Materials, any air gun that shoots at a velocity in excess of 350 feet per second should carry a warning stating in part, "Not a toy.... Misuse or careless use may cause serious injury or death." The Beeman/Feinwerkbau air guns all have velocities near or greater than 500 feet per second.

In closing, let me suggest that the information given your readers does nothing but perpetuate the misinformation surrounding guns. Air guns are extremely fun and addicting to shoot, but they are real guns and should always be handled as such.

John Clark
General Manager
Beeman Precision Airguns

Pomo Should Go

Far be it from me to suggest you seem to have it in for things French, but your guide to trendy French intellectuals ("Pomo to Go," *Wired* 2.06, page 54) was exhausting – and took away valuable space from your advertisements.

Lawrence D'Oliveiro
LDO@waikato.ac.nz

Thanks for Your Support

I drive a taxicab in San Francisco. Last week I had the pleasure of using one of your bits of new jargon. I picked up this yuppie ... or should I say cuppie (straight laced computer nerd ... i.e., no fun) in the Haight. We drove to North Beach, and on the way I asked him about his vocation. It turns out that he was an Apple employee working on the second version of the Newton. He was really "up" on telling me everything he knew about it. I started to feel like I was going to have to buy one just to get the guy out of my cab. It was a cross between an infomercial and a Ronco-Popeil Pocket Fisherman advertisement. What could I do? Then it hit me ... so I asked: "Well, that's all fine and good but does it have LRF support?"

Silence.

Thanks to "Jargon Watch" (*Wired* 2.06, page 31) I got to collect my fare and drive away while he was still baffled! As I drove off, I heard him say, "LRF?... LRF...? I'm sure we can look into it."

Kevin John Black
cole@mercury.sfsu.edu

Into Africa

I am not very pleased to see that the information superhypeway now goes right through Dakar, Senegal ("Wiring Africa," *Wired* 2.06, page 60). Go ahead: praise the good work of Babacar Fall and Jeff Greenwald – despite the latter's slightly colonial attitude – but hold on to your seats folks: there was intelligent life in the Third World before the Internet! Weirder still: there was even electronic communication! This was (and still is) the handiwork of various grassroots groups, NGOs (non-governmental organizations), and socially committed individuals, supported – but not directed or initiated – by networks such as Greennet, Peacenet, etc.

When we organized the Galactic Hacker Party in Paradiso, Amsterdam, way back in 1989, one of the biggest sensations was to experience how active the Third World was in the electronic field, ahead of the Western European scene.

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It is a good thing that the Internet has become the standard of (electronic) communication. But this is not a reason to put exaggerated faith in technological advances to foster development. The most important thing remains human commitment, which more often than not must translate to political will to provide services (to the people, old Maoists would add).
Patrice Riemens
Amsterdam

Kuwaiti Dishes

This appeared in your June issue (Electric Word, page 32): "Following Kuwait, China, and Saudi Arabia's lead, Iran has banned all satellite dishes. Next stop, France."

Contrary to the implication here, satellite dishes have most certainly *not* been banned in Kuwait. Dish dealers here have been *thriving*. In fact, we bought one for our house a week after your issue hit the stands. Among the channels received are CNN, Sky TV, MTV Asia, and Israel TV, as well as many others.

Furthermore, companies are now selling descramblers, so that Kuwaitis have access to movie channels and other premium channels. I suspect this is still illegal in the United States.

If anything, the average Kuwaiti's access to information has exploded beyond belief. With Kuwaiti Internet nodes and access to several commercial online services (such as AOL), along with fast-proliferating access to satellite feeds and the freest, liveliest media in the Arab world, Kuwaitis are closing in on Americans in terms of information overload.
Anwar Mohammed Ghuloum
anwar+@cs.cmu.edu

A Thief by Any Other Name

I am compelled to comment on the very interesting Wall Street article in your July issue ("Cracking Wall Street," *Wired* 2.07, page 92).

While other advanced countries place value on *inventing* stuff, *building* stuff and *exporting* stuff (a foreign concept to some theoretical physics grads, *creating* wealth), these rocket scientists spend their time learning to siphon off wealth while the transactional balls are juggled in the air. Clever fellas to be sure, but are they supposed to be neo-techno-folk heroes? I hope not. All in all, they're just junior robber barons with pocket protectors, still pissed off because they were chosen last for the kickball team. This is the '80s revisited, only with better computers.
Mark P. Miller
Tujunga, California

Via Snail Mail – from Sri Lanka

I was fascinated by the piece on General Magic in the April *Wired* ("Bill and Andy's Excellent Adventure II," *Wired* 2.04, page 102). Please note that the correct version of my third law is: "Any sufficiently advanced technology is indistinguishable from magic."

Incidentally, I've now formulated another law: "Reading software manuals without the hardware is as frustrating as reading sex manuals without the software."

Bruce Sterling's dispatch from Moscow ("Compost of Empire," *Wired* 2.04, page 73) is brilliant and scary. It recalled "The Third Man" – who would you cast to play Harry Lime?

All good wishes,
Arthur C. Clarke
Sri Lanka

P.S. For once, *Wired* is behind the times – Jef Raskin is right about the Sony SW1 ("World-Wired Without Wires," *Wired* 2.04, page 120): it has been my faithful companion for years but is now retired. Has he seen the SW100? Wow!

"Spam Spam Spam Spam..."

Did you guys catch that article in *Time*? Whatta riot!

This was my favorite bit (about "spamming" someone on the Net): "[It is a] colorful bit of Internet jargon meant to evoke the effect of dropping a can of Spam into a fan and filling the surrounding space with meat."

What? *What*?

I laughed and laughed. OK, I could be wrong, but I thought that "spamming" derived its name from the Monty Python spam song, wherein the word "spam" is repeated incessantly until it drives someone crazy. Just like e-mailing people the same message until it drives them crazy!

However, I thought maybe *Time* was onto something, so I picked up some Spam at the nearby grocery store and dropped it onto my fan. I was sorely disappointed. Not only did the surrounding space not fill with meat, but I broke my fan. I think *Time* owes me big, don't you?
Steven Frank
stevenf@europa.com

Appropriate Appropriation

The answer to Lance Rose's question is, Yes, I did create all the original elements for the photo composition that *New York Newsday* appropriated without compensation or permission ("A Sample Violation," *Wired* 2.06, page 32). In fact, all my composite images are created entirely from my original elements, which are taken from my stock library or shot specifically for the intended purpose.

Curiously, I've noticed that proponents of free image-appropriation (Hayes Cohen, Bart Nagel) are people who don't have any images. Perhaps if they spent 22 years of their lives making original photographs, they would feel different.

And if mass image-appropriation becomes the norm in the future and any published photograph is free for public use, you might find that artists who are making original images will keep most of their work out of the mass media. Imagine the ocean of mediocrity that would prevail.

I hope this lawsuit will set a public precedent that warns image thieves of the consequences of digital theft and protects those who have the ability to make original photographs.
James Porto
New York

Peaceful Wires

Your article "Digital Dharma" was great (*Wired* 2.08, page 54). I was a bit concerned, however, that the inclusion of the Tibetan government's e-mail address might result in an overflow of e-mail that is expensive to process, because of connect/transmit charges and the distance bridged in dialing the e-mail server.

Some months ago, I sent e-mail to the Tibetan government in exile in Dharamsala, offering to help with its online capabilities. I got a very nice response from the main monk running the Net connection. In my e-mail, I had raised the question of junk or gratuitous e-mail, and the response I got was, Yes, pulling down mail is expensive and time-consuming for them. So, perhaps communications should be limited for now.
Derek Kueter
E-mail address withheld

Undo!

► In our "The Americanization of Sony" article (*Wired* 2.06, page 94), we reported that Sony introduced the first successful transistor radio in 1955. In fact, the first transistor radio was produced by Regency (in collaboration with Texas Instruments) in 1954, in Indianapolis, Indiana: it was a pocket-sized radio and was a commercial success. ► *The Cosmology of Kyoto* CD-ROM (reviewed in *Wired* 2.09, page 131) listed now-obsolete coordinates for ordering the product. If you'd like more information on this disc, please contact Stone Bridge Press at PO Box 8208, Berkeley, CA 94707; (800) 947 7271, fax +1 (510) 524 8711. ► A quick note regarding the German V series rockets mentioned in August's Reality Check (page 34): they were actually self-guided, not tele-operated. ► And finally, to correct a minor mistake in "King of the Hunt" (*Wired* 2.07, page 33), we listed the directory housing information on the Internet Hunt as *pub/internet-hunt*, when in actuality, it's *pub/hunt*.

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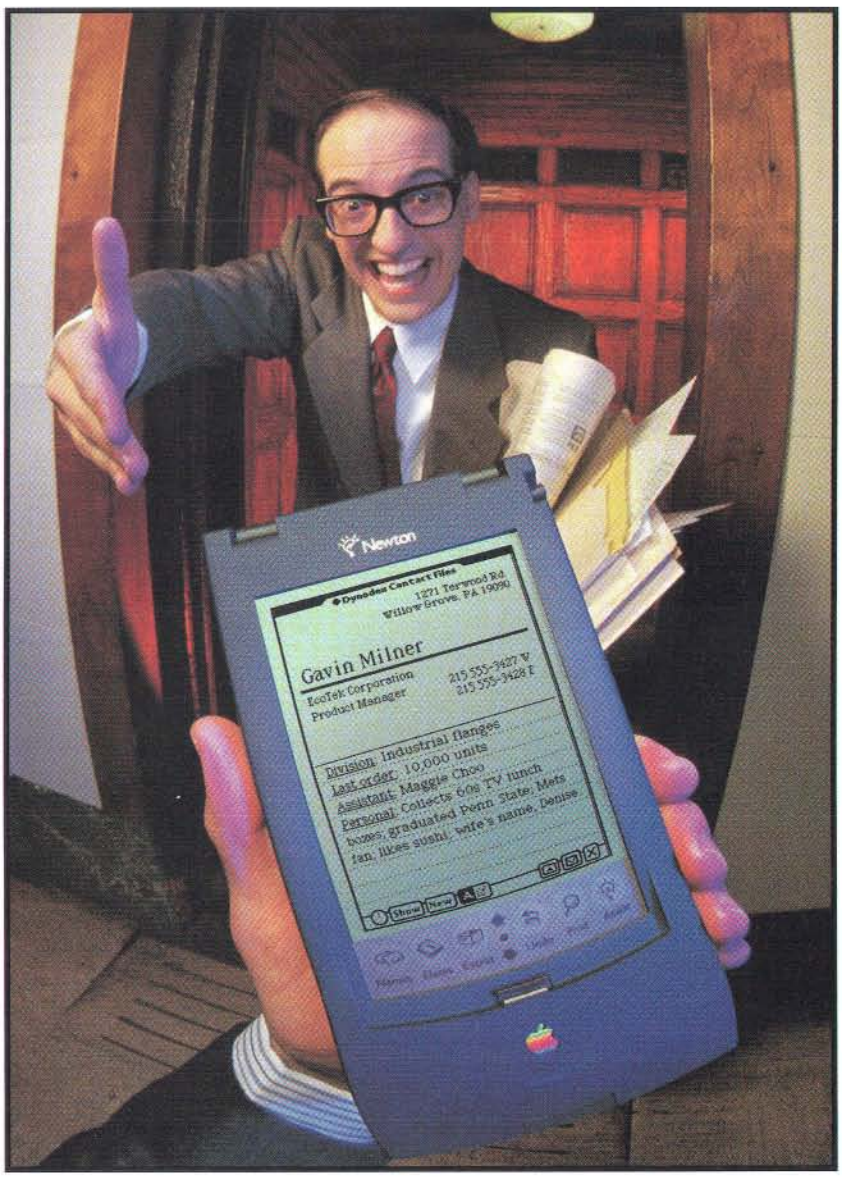

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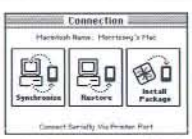

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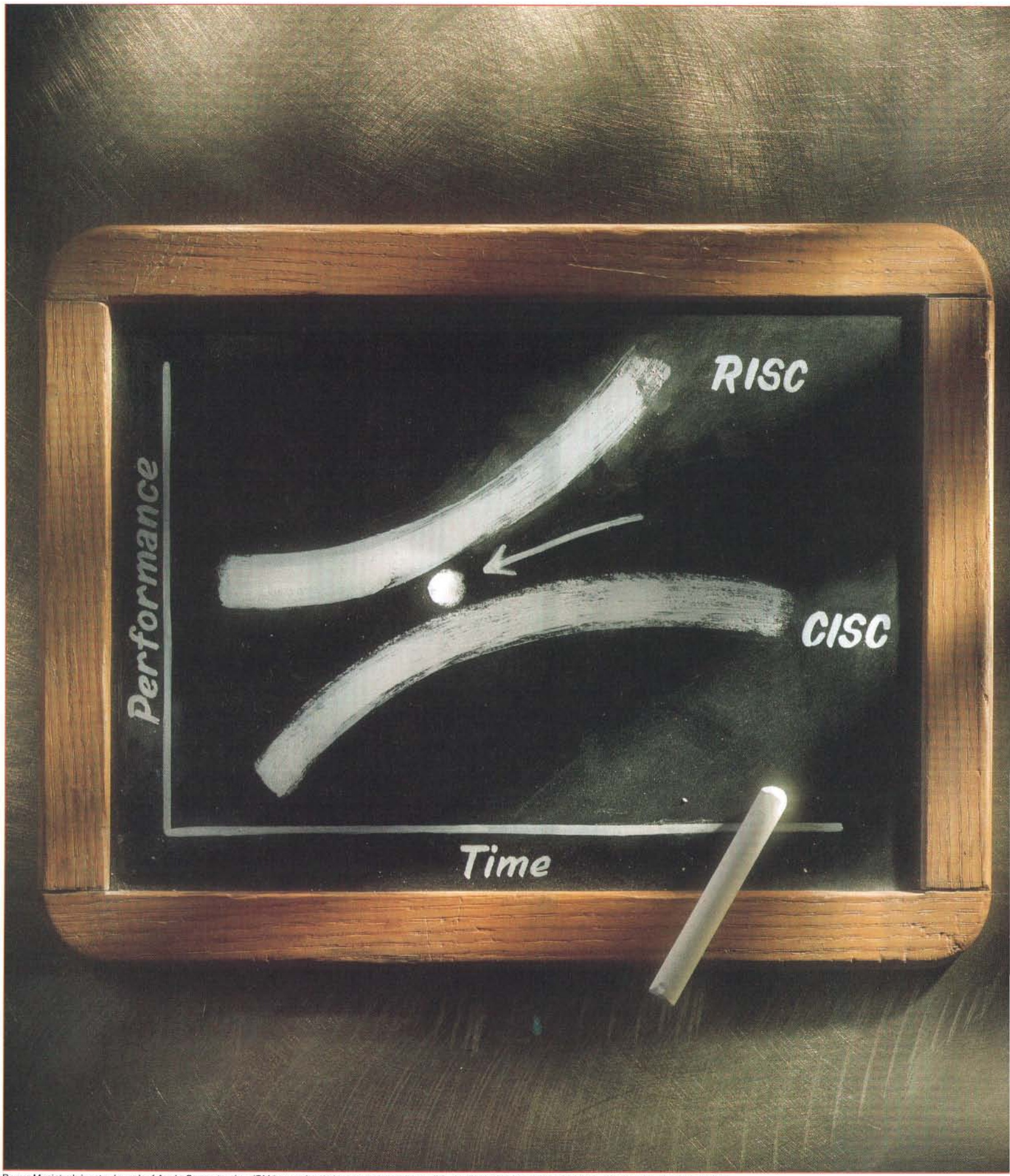

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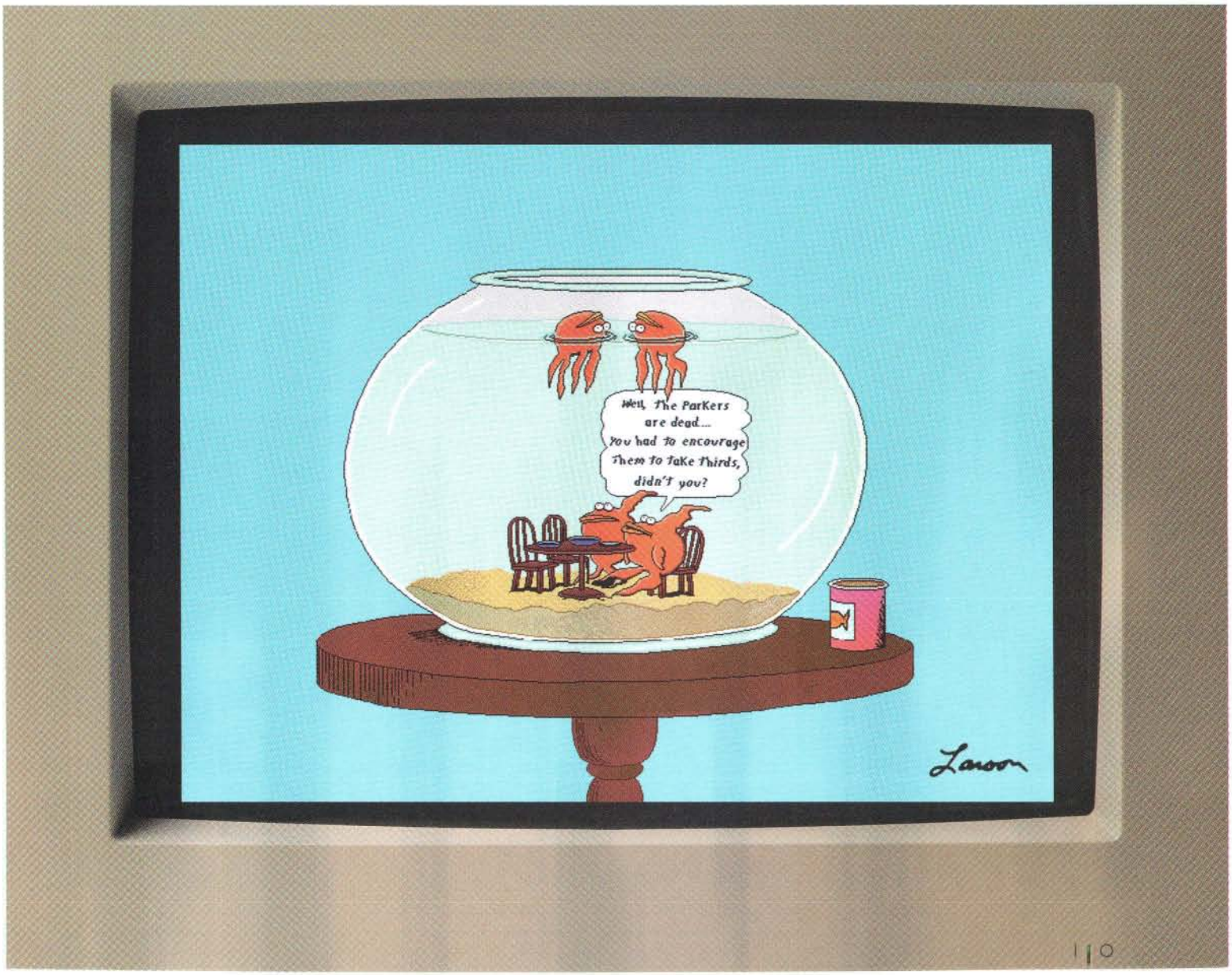

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ELECTRICWORD

Spooks in the Machine

WIRETAPPERS: MOVIE STILL ARCHIVES

If wiretap software is digital cancer, then a digital wiretap bill introduced in the US House and Senate on August 9 could be considered digital chemotherapy. Like its analog kin, digital chemo will make you sick; it's a poison to be willfully ingested for the "greater good." Sponsored by Senator Patrick Leahy (D-Vermont) and Representative Don Edwards (D-California), this legislation will require telephone companies to ensure their digital networks are "wiretap ready." Without it, the FBI probably would have had its original, much more sweeping wiretap proposal snuck into law as a rider on a crime bill, allowing it to become law through the proverbial "back door" and with little public debate.

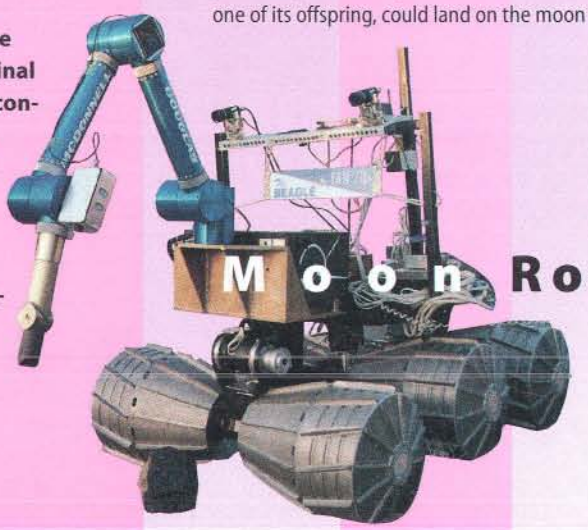
Although the FBI got a large portion of what it wanted – a codified, put-up-or-shut-up piece of legislation that mandates wiretap access to almost every communication network in the United States – it didn't get everything. While the bill as introduced covers providers of public telecommunications, it doesn't let the bureau get its hands on the coveted Internet or any other online system.

While the Electronic Frontier Foundation (EFF) has been catching heat from some in the Net community for rolling over and playing dead on this one, many of the provisions in the Leahy/Edwards bill in fact limit the government's current wiretapping authority. Among the added protections the bill outlines is a requirement that the feds get a court order if they want to poke around in your online records – whom you've sent mail to, what you've downloaded – while currently all it takes is an administrative subpeona, signed by the investigators themselves. The legislation would also prohibit the use of certain devices for tracking your transaction history and expand current privacy provisions to cover wireless phones and some radio-based communications.

According to Jerry Berman, policy director for the EFF, the organization's position on the bill is "complicated by the fact that we don't think a digital telephony bill is necessary. We're not opposing this legislation," he added. After all, the EFF helped develop the Leahy/Edwards bill. "We support the privacy provisions. But it has to be *this* version and *this* package." Says Berman: "It's still a troubling precedent to have government make industry think first about making networks wiretap ready."

While some privacy groups are pleased with the Leahy/Edwards bill, compared with the FBI's original plans, the Electronic Privacy Information Center continues to fight it. The center believes the privacy protections don't go far enough and that the FBI has yet to present to the public any concrete evidence proving it needs the legislation. In fact, the center has filed a suit against the FBI, seeking to force the bureau's release of this documentation. Stay posted. – *Brock N. Meeks*

Moon Roaming by PC



Marsokhod is a small planetary rover that looks like a cross between an insect and a monster truck. Its Russian-made chassis has six barrel-like wheels on three independent axles and a mechanical arm developed by McDonnell Douglas. But the neatest thing about it is the pair of video cameras that transmit a real-time, color, stereo video signal that can be synched into a helmet anywhere. When you strap on the helmet and grab the remote controls, you are virtually "in the driver's seat."

Marsokhod is an ongoing joint project between McDonnell Douglas, the National Aeronautics and Space Administration, Russia's Lavochkin Association, and the University of Hawaii. If all goes well in Washington (where NASA's budget is perennially under siege), Marsokhod, or one of its offspring, could land on the moon within the next several years, as the third mission in NASA's Discovery program.

And once the scientists have their turn, John Garvey – project manager for planetary systems at McDonnell Douglas – says lucky students will be able to control the vehicle from a classroom using a cable TV connection, a modem, and a PC. In fact, just such a link took place last summer when McDonnell Douglas wired a Santa Ana, California, high school to the rover at NASA's Ames Research Center a few hundred miles north, in Mountain View. As Garvey points out, there is no better way to excite students about science than to let them take a cruise on the moon.

To find pictures from the rover's tests on earth, ftp to *artemis.arc.nasa.gov* under amboy. For more info, e-mail John Garvey at *garvey@apt.mdc.com*. – *Caleb John Clark*

The Apology Line

"Mr. Apology" was quite the shoplifter. Being an artist, he stole mostly art supplies. Then, in 1980, he started to feel ashamed. "Shoplifting," he explains, "began to seem juvenile, almost scuzzy. I wanted a way to reconcile my darker side with my lighter half."

Figuring there might be one or two people in New York City who also harbored a hidden guilt, Mr. A (as he became known) designed an automated, non-religious, phone-in apology service. He put flyers up around the city, soliciting the public to call a machine-answered phone number and apologize for whatever was weighing down its soul. The response was overwhelming. Husbands called in to apologize for adultery, children called in to apologize for cheating at school, and, most disturbing, criminals (rapists, thieves, self-proclaimed murderers) called in to apologize for and sometimes try to justify, horrific acts of violence. (A lot of these calls are probably jokes, but the acting is superb.) Mr. A thematically re-cut the tape and kludged together some answering-machine equipment so callers could listen to other people's apologies and leave comments or apologies of their own.

Now, 14 years later, the Apology Line gets more than 100 calls a day from all over the United States and Canada. Mr. A, its "sysop," has installed a modified four-line voicemail system run off a "basically nondescript," souped-up 386 SX. The call-in menu offers choices like sex, romance, homosexuality, crime, child abuse, hatred, addiction, church of the apologetic predator (spiritual matters), humor or mild humor, and general. Mr. A funds the whole operation himself.

You can reach the Apology Line at +1 (212) 633 8323, +1 (212) 255 7714, or +1 (212) 255 2748. There is no charge beyond normal phone rates. You can help support the line by calling the same numbers and buying the *Greatest Hits of Apology* cassette and the *Apology* 'zine. – *Cleo Paskal*

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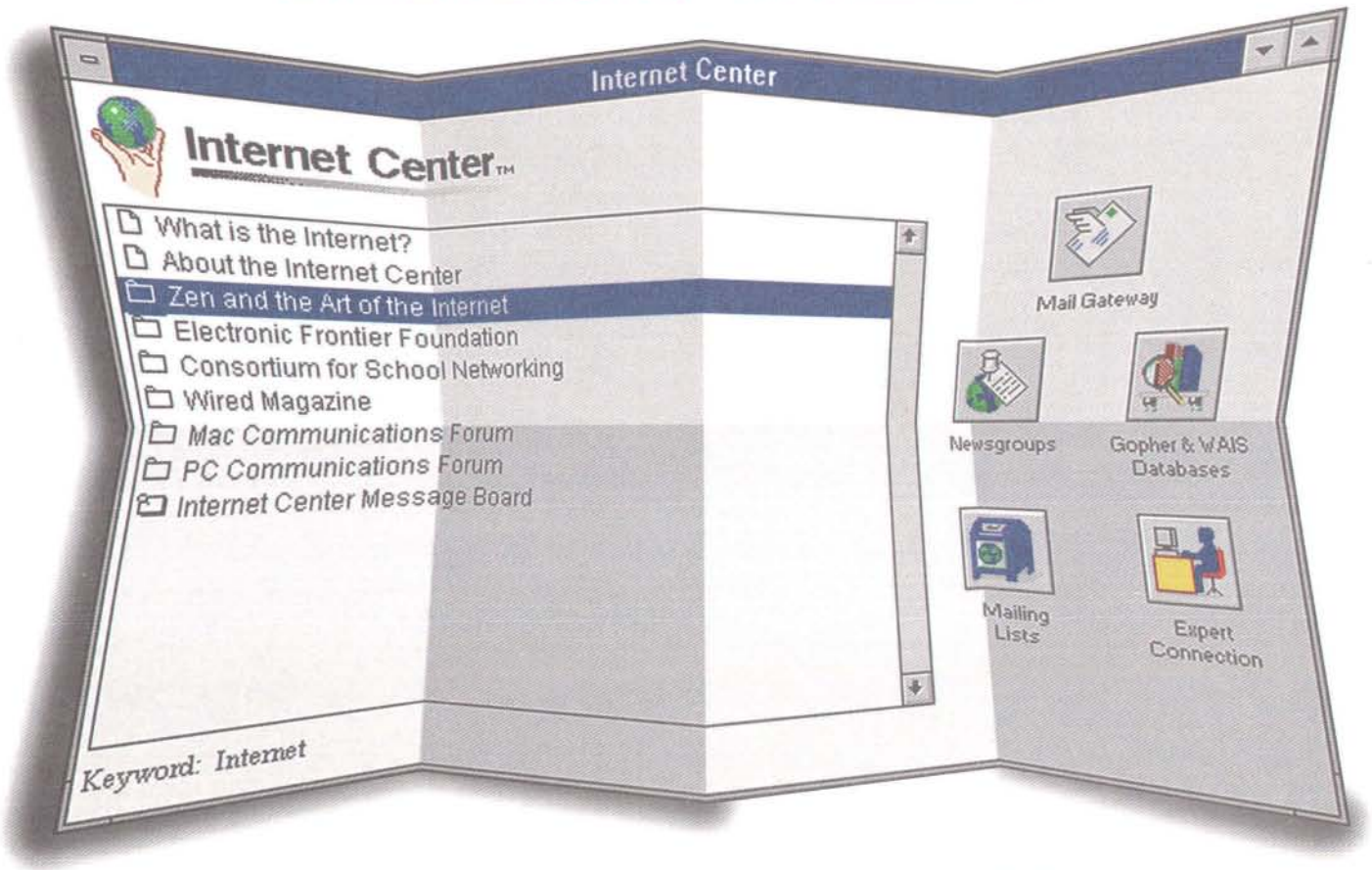

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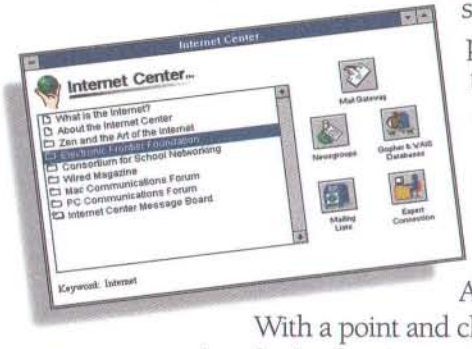

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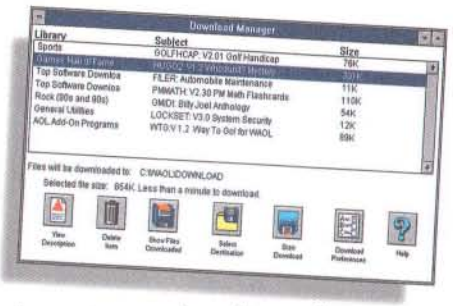

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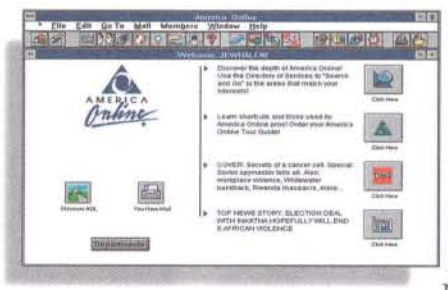

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In Jail for E-mail

In April this year, Matthew M. Thomas – then a freshman at Stephen F. Austin State University in the forested East Texas town of Nacogdoches – sent an e-mail massage to President Clinton: "One of these days, I'm going to come to Washington and blow your little head off. I have a bunch of guns, I can do it." Thomas's message also threatened Hillary Rodham Clinton and presidential daughter Chelsea, "because they deserve to die as well." Thomas got a personal response, not from President Clinton, but from the US Secret Service.

On June 21, the 19-year-old pleaded guilty to the federal charge of sending an interstate threat to another person, according to Title 18, United States Code Section 875(c). He now faces a maximum sentence of five years in federal prison, a US$250,000 fine, and three years of supervised release.

Thomas used the name, date of birth, and social security number of a former roommate to gain access to the university's computer. Secret Service agents determined culpability in a rather low-tech way: they interviewed the owner of the account and "got some leads," according to Assistant US Attorney Allen Hurst. They then interviewed several students from Thomas's dorm, and eventually extracted Thomas's confession. Stephen F. Austin State University's computer access policy is now under review, said Mike Jennings, computing and telecommunications officer. He said changes in policy, however, could do little to prevent similar incidents.

"I hope it will wake people up and make people realize they could be prosecuted for sending threatening messages over e-mail systems," said Hurst, who is based in Tyler, Texas, and is handling the prosecution. Prosecutors don't need to show that the accused intended to or could have carried out a threat. In fact, Hurst said the US Attorney's office had no such proof in Thomas's case.

"Sending the threat is itself a crime, as long as it's not just a joke, or a mistake, or some kind of idle talk," Hurst said. At press time, Thomas's sentencing was expected by mid-September. – *Nick Montfort*

≡III Interstate Transit: Thinking of perusing the seamier side of the Net and perhaps downloading some of your very own images to your very own computer? Your choices have been recently limited by an Oklahoma court. In what seems to be a trend (justified by much hand wringing over how this filth might get into the hands of children), the court slapped Oklahoma Information Exchange sysop Tony Davis with 10 years in the pen and a US$10,000 fine for "trafficking in obscene images." This follows on the heels of the arrest in July of a California couple, based on a warrant in Tennessee. Ain't it grand when the State starts defining obscenity? When will it learn that legislating morality online is as pointless as it is off? ≡III Maybe Never: Do you smell a trend? Al Gore recently had this to say when asked if he would regulate the Net: "I do not rule out minimalist measures to assist parents in satisfying the legitimate concerns that they have." Watch out, folks, here it comes. ≡III Ziff Tiff: So IDG's *Infoworld* has pulled out of its agreement to work with Ziff Davis's Interchange online service, ostensibly because negotiations were taking too long. We *could* of course speculate about the real reasons ... like, for instance, that IDG's not even sure the service will launch at all, what with Ziff being auctioned and new projects (which could include the ineptly named *Computer Life*) being cut to conserve cashflow and service the debt.... Or, say, feeling snubbed, excluded from the bidding by the Ziff brothers, IDG wants to cast doubts on Ziff's valuation. Whispers this side of Microsoft hint that the software giant would like ►

FACING PAGE: JILL GREENBERG, GARVEY: WILLIAM FAULKNER

Telepanhandling

Imagine a radiation-scarred Rodin sculpture in an electric wheelchair that's also a party crasher and an "aggressive panhandling robot." Such is the automaton created by San Francisco artist Frank Garvey.

When Garvey set Goboy loose in the San Francisco Museum of Modern Art, the radio-controlled robot screamed: "Gimme 50 cent! God says to gimme 50 cent!" The patrons responded with stupefaction and fear. At last year's Los Angeles Art Fair, several people actually assaulted the robot.

Most folks view the screaming robot-on-wheels as either a hoot, a threat, or an annoyance. However, Garvey insists that the robot's true effect is hardly so superficial: "Goboy represents the birth of a much more assertive working-class art that's not willing to be 'folk art' anymore, not willing to be passive anymore. It represents the intervention of the underclass at the level of mass culture."

Whether or not Goboy raises deeper sociological issues, he definitely raises cash. At the LA Art Fair the panhandling robot hauled in more money than some of the exhibitors. Garvey can be reached at Theatre Concrete: +1 (415) 621 4068. – *Alan Rapp*

Beaming over a Book

Picture a network of scanners, printers, and servers around the country that digitally prints and binds books, while keeping track of copyright holders and royalty payments. An experiment in scanning fragile books and using the images for interlibrary loans between universities has led to the Xerox Documents on Demand system. Some 107 clients have signed up, led by universities such as Harvard, Cornell, and Yale. According to Steve Hall, director of the office of information technology at Harvard, the system is being used by professors to create custom books for courses.

Royalties can either be managed by the publisher or by a third party like the Copyright Clearance Center, since copyright-handling is built into the Documents on Demand software.

Xerox envisions copy shop networks doing a brisk business printing books for consumers, much as they handle faxes today. Xerox is billing this as an open system and permitting other hardware vendors to connect to the Documents on Demand network.

But a new, more advanced operating system, scheduled for release this fall, called DocuSp, will be proprietary to Xerox. Lisa Freeman, Director of the University of Minnesota Press, would like to see an open operating system for electronic publishing. "Xerox is using a propriety file format," she says. "If they were to get on the interoperability bandwagon, we'd see it as really appealing."

The basic system, which doesn't include a high-quality printer, starts around US$28,500. A top-of-the-line printer will add up to US$290,000. For more information contact Xerox Corporation: +1 (716) 422 1041.

– *David Bennahum*

► nothing more than to buy, then junk, Interchange, thereby leaving Apple's eWorld as the sole competition to Microsoft's forthcoming online service, Marvel. And we all know what happened the last time Microsoft went up against Apple in an emerging market. ☰III Hurry Up, *Myst II*: A Dataquest survey found that 40 percent of folks with PC CD-ROMs never use their drives, and 54 percent have no plans to buy new software. Ouch. ☰III Net Facts: The latest survey of Internet-connected machines shows staggering 81-percent growth over one year ago: as of July 1994, there were 3.2 million machines directly connected to the Net. This figure doesn't reflect machines *connected* to those machines, of course (at *Wired*, for instance, we have 60 or so computers running off our one Net node). More than 1 million new hosts were added during the first six months of 1994 alone. For more detailed Net data see the zone directory on *ftp.nw.com*, or the Net Wizards World Wide Web home page at *http://www.nw.com*. ☰III Other Cool Net Facts: We culled these from Win Treese's second Internet Index: Percentage of registered commercial domains with addresses in California: 27. First public library to offer free access to the Internet: Seattle Public Library. Number of copies of Mosaic downloaded from NCSA per day ►

JARGON WATCH

Bottom-lining – Selecting affluent communities for trial and early deployment of new, interactive services.

Bozon – A unit of stupidity. "Is it just me, or is there always a high bozon count in Rupert's posts?"

Docubug – A mistake in computer documentation. Used in the technical writing department (the "DocuZoo") at Sun Microsystems.

Furverts – The denizens of FurryMUCK and alt.fan.furry, or other people who enjoy emulating anthropomorphs (humanoid animals). Not to be confused with the people who post on alt.sex.bestiality.

Plug – Term for either a temp worker, or a new addition to a work staff, who covers work overflow. "He's a plug for Jean until she gets back in June."

ROM brain – Someone who spews forth ideas and opinions but can't seem to accept any input from the outside world.

Rumorazzi – Writers of various back-page "industry insider" columns in computer trade journals. Dedicated to collecting and reporting (and sometimes debunking) various rumors and secrets within the industry. "Be careful at Comdex; you never know where the rumorazzi may be lurking."

SITCOMs (Single Income, Two Children, Oppressive Mortgage) – What yuppies turn into when they have children and one stops working to be with the kids. The true martyrs of Reaganomics, as characterized in *The Economist*.

– *Gareth Branwyn*

Thanks and a tip of the *Wired* propeller beanie to: Jim Crawley, Ruth Anne Bevier, Dan "Sleepy" Sears, Kit Ranshoff, *Croyd@aol.com*, Bruce Oberg, arturner, *JohnR470@aol.com*.

In Jargon Watch 2.08, an AI gremlin made off with the list of contributors. Our belated tip o' the beanie is directed towards Peter Rothman, Dav0 Perry, and Pierre Bourque, who coined the term "Jargonaut" as part of an unofficial alt.wired newsgroup contest dreamed up by Carl Kadie.

FACING PAGE: STEVE FUJIKAWA

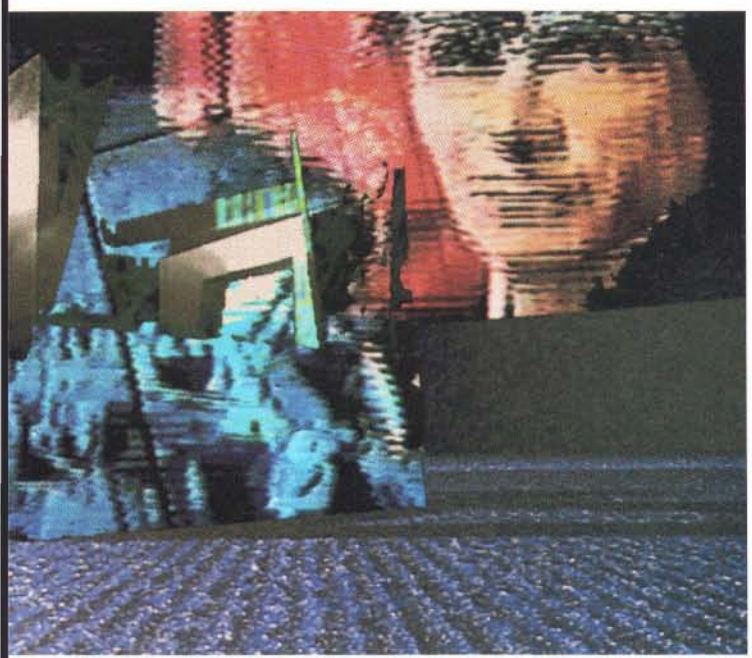
CyberRep Sinks Clipper!!!!!!!!!!!!!!!!!

Last year, Representative Maria Cantwell took on the national-security establishment by introducing a bill in the US Congress to relax the existing Draconian controls on the export of encryption software. Backed by an eclectic mix of computer-biz bigwigs, hackers, and civil libertarians, the 35-year-old Democrat from Washington state began negotiating directly with Vice President Al Gore. In late July, when Gore announced the administration's dramatic about-face on the Clipper Chip and signaled a willingness to work with industry and privacy advocates on a solution to the encryption problem, he did so in a letter to Cantwell. "She went eyeball-to-eyeball with the White House," said Nathan Myhrvold, Microsoft Corporation's vice president for advanced technology. "And they blinked."

That Myhrvold could be found kissing up to Cantwell is no surprise. Microsoft sits in the very heart of Cantwell's leafy suburban Seattle district, which is also home to a slew of other high-tech firms from Nintendo to McCaw Cellular. It's not surprising that Cantwell styles herself as a pro-business, pro-green Democrat.

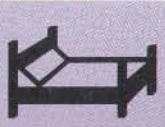
In Washington, her involvement in the encryption debate has earned her a different sort of reputation – as the first congressperson from cyberspace. Yet despite her success so far, the job is far from complete: Clipper may be dead, but absurd software-export controls remain. Sure, Gore is newly committed to some reasonable principles – that any US encryption system should be voluntary, exportable, unclassified, et cetera. But Cantwell's lobbying may still be required to ensure that economic sense prevails over spook-sponsored paranoia. Hear, hear. – *John Heilemann*

Art House



Marcos Novak, director of the Advanced Design Research Group at the University of Texas in Austin, is making buildings out of music, dance, and lyrics. He has developed an application to convert MIDI data into databases that can be used to create what he calls "liquid architecture." The virtual buildings offer new ways to navigate through a musical composition or explore the movements of a dance performance.

A recent project at Canada's Banff Centre for the Arts used the work of an architect, a dancer, and a musician as the data stream for Novak's program. The session generated five worlds (shown here), ranging from the realistic to the phantasmagorical. Marcos Novak: *marcos@bongo.cc.utexas.edu.* – *Clay Graham*



TIRED	WIRED
Angst	Amusement
Sushi	Tapas
CD-ROMs	Recordable CDs
Neuro-Linguistics	Hooked On Phonics
Copping a plea	Selling movie rights
3-D audio	Tube amps
ARDIS	Metricom
Barney	Mighty Morphin' Power Rangers
"Ginsberg Wore Khakis"	Burroughs's Nike Ad
Engineering	Evolution
SLIP	PPP
The State	*Kids in the Hall*
Opposing Clipper	Opposing the digital telephony bill
Disneyworld	Vegas
Models Inc	*Absolutely Fabulous*

► as of August: 1,600 (for more on Mosaic, see page 116). Want more? Go to *http://www.openmarket.com/info/internet-index/current.html*. ☰III More Government Fun: That nutty Working Group on Intellectual Property Rights, part of the Clinton administration's Information Infrastructure Task Force, has come up with some interesting recommendations while puzzling over the issue of "copyright protection." To protect said rights in the digital age, the committee recommends prohibition of, and we quote, "importation, manufacture, and distribution of devices, or the offering or performance of services, if the primary purpose or effect is to circumvent technological protection of exclusive rights." In another age, such language would have excluded printing presses, copy machines, and BBS software. Tread lightly, you crazy bureaucrats. Get your own copy of the Task Force's "Intelletual Property and the National Information Infrastructure" report by calling +1 (703) 305 9300 or writing the US Patent and Trademark Office, Box 4, Washington, DC 20231-0001.

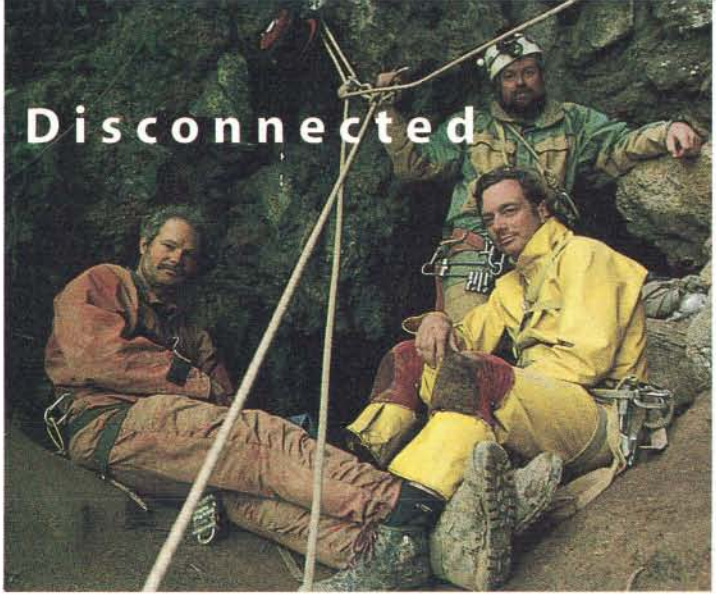
☰III IBM Has a Bridge to Sell You: From its latest venture, it seems Big Blue has a lot of spare Big Iron laying about unused. As the mainframe biz declines, IBM's development geniuses are casting about for a market with few competitors and a lust for new, computer-intensive services. And the winner is – the

Another Poppin' Fresh Lawsuit

The flying toaster, flagship of the popular After Dark screen-savers for personal computers, is described by its publisher, Berkeley Systems, as "a scrappy little hero." It also earns the company millions of dollars. Last year, Berkeley Systems sued competitor Delrina Corporation over a screen-saver depicting a cartoon character shooting down the ubiquitous winged appliances. Delrina claimed its toaster hunter product was a legal "fair use" satire of the popular After Dark offering, but the judge ruled that Delrina's flying toasters infringed the "total concept and feel" of Berkeley Systems's toasters. According to the judge, Delrina's product did not merely comment on Berkeley's, but competed with it for the same customers.

Now it's Berkeley Systems's turn to be taken to court for toaster infringement, courtesy of Jefferson Airplane. In a lawsuit filed on June 14 in San Francisco, lawyers for the former rock group say Berkeley ripped off the winged toaster from the cover art of Jefferson Airplane's 1973 album, *Thirty Seconds Over Winterland*. The album

Deep, Dark, and Disconnected



HUAUTLA: J. CARL GANTER/CONTACT PRESS IMAGES

How do you stay in touch with friends, family, and the outside world when you're almost a mile, Jules Verne-style, underground, exploring one of the deepest, most treacherous caves in the world?

When you're the US Deep Caving Team, slogging through subterranean passages where no one has slogged before, you turn to high-tech sponsors for help. The group convinced AT&T to provide 22 kilometers of Kevlar-reinforced fiber-optic cable as a link to the bowels of the earth for two-way voice and video communications during the 18-week project.

The cave's location is as remote as the project was ambitious. A 12-hour bus ride east of Mexico City on the Huautla Plateau leads to the tiny pueblo of San Agustin de Zaragoza. The village is perched on the rim of a vast sinkhole that drops away like a giant bathtub. At the bottom of the depression is a narrow entrance to the underworld – 72 kilometers of rugged passageways that make up what's believed to be the deepest, most extensive cave system yet discovered.

Communications below ground are key to survival. During a recent photo reconnaissance mission for *National Geographic*, half a dozen members of the team became trapped for several days nearly a mile underground when heavy rains drained into the sinkhole, creating unfordable 5-foot-high rapids in the cave's narrow passages. With a communications system intact, the team could have been warned of incoming inclement weather. But the might of AT&T's fiber optics, as it turned out, was no match for a machete-equipped Mazatec Indian community.

"The concept was great," says Bill Stone, standing on a mountain ridge overlooking the sinkhole and cave entrance. "We'd planned to have live video and a satellite uplink from here in the middle of nowhere beamed to living rooms around the world." Stone, a top engineer and inventor with the National Institute of Standards and Technology, had pieced together the entire expedition, combining the high technology of fiber optics and an advanced underwater rebreather system he invented with traditional mountain climbing know-how and the muscle of two dozen teammates.

As it turned out, whole kilometers of fiber-optic cable were slashed by the locals. A black wire strung through the jungle might anger the spirits of the cave, the peaceful Mazatecs thought. A few hacks with a machete was all it took to disconnect elaborate plans. "We have to figure out how to explain this to our sponsors," Stone says.

The interrupted communications didn't prevent the team from charting previously unexplored depths of the cave, however. On their next mission, the spelunkers hope to connect the deep Huautla tunnels with a resurgence spring several miles away. – *J. Carl Ganter*

Internet! Earlier this summer IBM introduced the IBM Global Network, an attempt to create an Internet-like network for corporations and business customers. Hmmm. Isn't there already one of those? ≡III Twinkie Defense Revisited: Did you hear about the kid who got off on charges of attempted murder by claiming he was driven insane by playing too much *Mortal Kombat*? We are not making this up. Paul Van Schaik, 16, of Fort Lauderdale, Florida, stabbed a classmate 17 times with steak knives (both hands!) in a demented quest to attain the next level in the gory videogame. Ruled legally insane and sent to a state institution, Van Schaik has provided a rallying cry for the anti-violence lobby. Come on. Nutcakes are nutcakes. If it's not *Mortal Kombat*, then it's Mondays. It ain't the medium, it's the world. Get over it, or ban the seven-day calendar. ≡III Speaking of Which: Acclaim, creator of *Mortal Kombat*, wins the Really Stupid Marketing Award for the month. With a theme of "Paint the Town Red," Acclaim's new *Maximum Carnage* starts where *Mortal Kombat* left off. That's "red" as in blood, of course, but those wacky marketing types at Acclaim smelled a dumb double entendre (or easy PR pitch) and formulated a whole campaign to "encourage reading" among thumb-candy- ►

cover, featuring flying toasters, was created years before screen-savers – or the personal computer industry for that matter – were a twinkle in a hacker's eye. Berkeley Systems admits the Jefferson Airplane picture came first, but says its cofounder and CEO never saw it before releasing After Dark.

Even if Berkeley Systems copied the Jefferson Airplane toasters subconsciously, the question remains whether the company took only the "idea" of flying toasters from the Jefferson Airplane album (permitted under copyright law) or went further and copied Jefferson Airplane's copyrighted expression of that idea.

Imagine asking a bunch of artists who never saw the Jefferson Airplane or Berkeley Systems versions to draw a flying toaster. Would they come up with the same old chrome model with wings, or might they depict a variety of designs ranging from combat helicopter toasters to toasters suspended from balloons? The more different ways the idea of a "flying toaster" can be expressed, the more legal protection Jefferson Airplane might have for the model on its cover.

More on this when something new pops up. – *Lance Rose*

WIRED TOP 10

Scarcest Vehicles Found in Microsoft Parking Lots

(one of each found in 3,000 sampled)

1. **Kayak**
2. **BMW K1 motorcycle**
3. **Ferrari Testarossa**
4. **Good Humor ice cream truck with "Say nope to dope" painted on side**
5. **Checker Marathon**
6. **Amphibious German vehicle (make & model unknown)**
7. **1959 Cadillac convertible**
8. **1973 Lotus Europa Special**
9. **Motorboat (without trailer)**
10. **VW Thing**

Thanks to Martin Tobias for survey

M(onopoly) TV?

Several of the nation's biggest record companies clearly want more than their MTV.

Having complained for several years that many of their new acts weren't getting played on cable's premier music channel, a handful of labels have teamed with Ticketmaster to launch a rival service by January.

The partners include Warner Music Group, Sony Music Group, EMI Music, and PolyGram Holding Inc., as well as Bertelsmann Music Group (BMG), which agreed to join in late June after scuttling a proposed channel of its own that was to have been formed with Tele-Communications Inc.

Even though, as *Wired* goes to press, the new venture doesn't yet have a name, a management team, or commitments from cable operators, its existence is causing a stir in the music business, where talk of monopolistic business practices can be heard.

"If their intent is to somehow control the flow of content and create a channel where they get the first window on videos, it'll be a real problem," says Les Garland, who helped launch MTV and now runs Video Jukebox Network Inc., and whose show, *The Box*, gets 50 to 60 percent of its videos from the big labels.

For their part, the record companies deny such motives. "We don't want to corner the market," says Joel Schoenfeld, BMG's general counsel. "But we do want the best exposure for our video products."

And one other thing: the labels want to start a "pay-for-play" system, which means MTV and others will have to fork over fees to copyright holders. And who are these copyright holders? In most cases, the big labels.

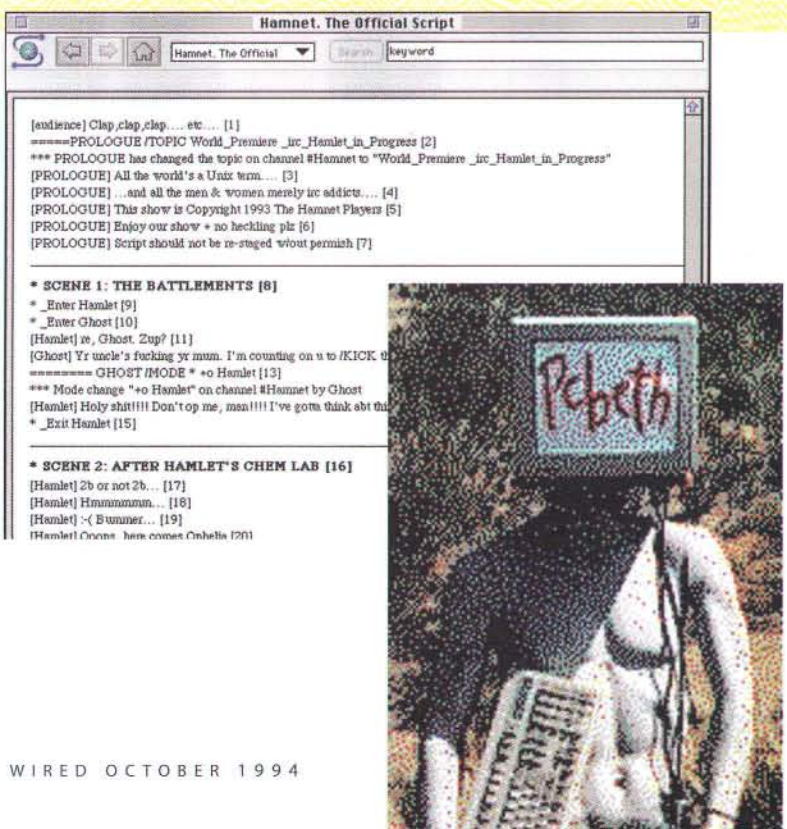
So far, MTV officials have been diplomatic but firm, saying that there won't be a problem so long as videos remain available. Besides, MTV has been moving away from its traditional reliance on videos as a primary form of programming.

"MTV knows it'll be harder to get videos," says Dave Marsh, who publishes *Rock 'n' Rap Confidential*, an industry newsletter. "The primary suppliers of videos are about to go into the same business."

It's a point that hasn't gone unnoticed in Washington. The Justice Department's antitrust division has begun an inquiry into the record companies' planned venture. And the same House subcommittee holding hearings on charges that Ticketmaster is an unfair monopoly is also expected to turn its attention to the big labels.
– *Edward R. Silverman*

CAB: EUGENE GEBHARDT/FPG

► driven tykes. What are they calling it? "Paint the Town Read." Puuuuuuuuhleeeze. To participate, kids read four books and send an entry form to Acclaim. As with the public school system, no verification is necessary! The entry form is packed inside the *Maximum Carnage* game box, of course. Once Acclaim receives said entry form, it forwards "a certificate" to the kid's teacher. Sharpen those reading skills, kids. ≡III



Hamming it up on the Net

Shakespeare's ghost is in the Net. Last fall, Stuart Harris, an English filmmaker living in California, wrote a hilarious 80-line sendup of *Hamlet*. He formed a virtual acting troupe culled from Internet Relay Chat junkies and dubbed them the Hamnet Players. The first attempt to perform *Hamnet* ended in disaster when a lightning bolt cut power to Harris's access provider. In a later, successful performance, Ian Taylor, a member of the Royal Shakespeare Company, played Hamlet.

For these performances, "actors" from all over the world log on at a prearranged time and convene in Internet Relay Chat's #hamnet auditorium. The script serves as a springboard for the players, who mercilessly ham up their lines by juxtaposing Shakespeare's poetry and plots with IRC jargon and speed-writing conventions, irreverent obscenity, clever puns, and references to contemporary yuppie lifestyle. Hamlet's famous 35-line "To be or not to be" soliloquy is reduced to a mere "2b or not 2b." "Get thee to a nunnery" becomes "suggest u /JOIN #nunnery."

Hamnet was followed by performances of *PCbeth – An IBM Clone of Macbeth*, in which Banquo changes his nickname after his murder to GhostBan, a double play on the character of Banquo and on the IRC *+b* command, which bans a person from a server.

Logs of performances and color images of the *Hamnet* players in costume are available on WWW: *http://www.bath.ac.uk/~abpgah/pcbeth.html*. – *Brenda Danet*

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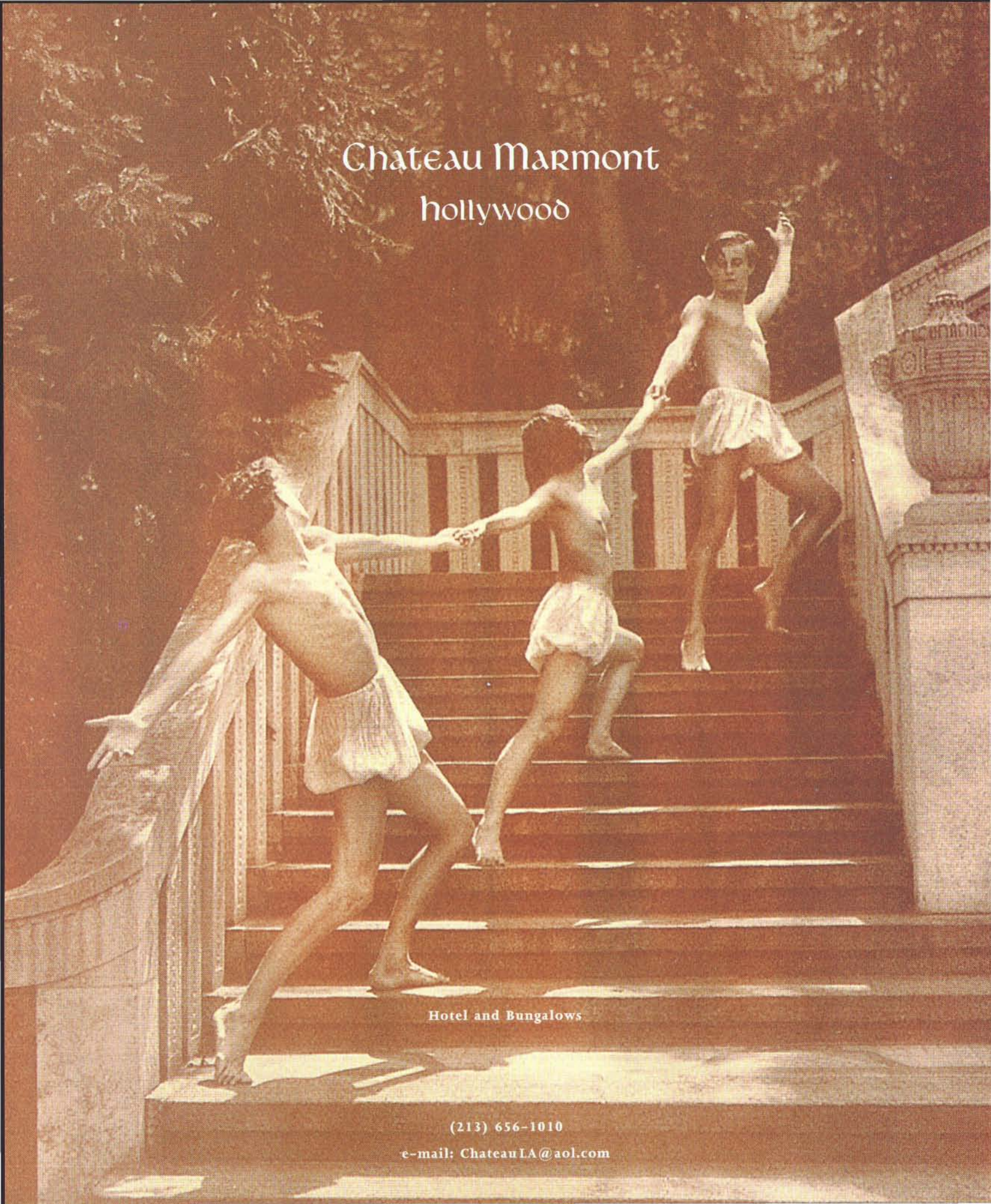
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FETISH

Edited by David Jacobs

Beat the Traffic

When the freeways jam, news stations send in the choppers to see if drivers will be stuck in traffic all afternoon. Won't they be surprised to see you zip past them in the air on your way home! The agile McDonnell Douglas 520N is the first helicopter to use Notar (no tail rotor) technology, which improves maneuverability and cuts down on noise. With a range of 212 nautical miles and a cruise speed of 125 knots, this is the ticket for beating the rush-hour blues. MD 520N: US$735,000. McDonnell Douglas: +1 (602) 891 5504.

Tangle Tamer

I can't handle all these extension cords sticking out of every box I own. I'm always tripping over them, and they're ugly as all get-out. I'm going to clean up my act with the PowerManager. It has inputs for five peripherals, and the cords are neatly coiled inside the casing. The device has built-in surge protection, and an LED will flash its little head off when it senses the outlet is unsafe. My portable computers are already drooling to connect with the outboard AC adapters, too. PowerManager: US$134.99. American Power Conversion: (800) 800 4272, +1 (401) 789 0204.

Spittin' Bits with Style

Visitors will know you won't stand for shoddy data transfer when they see the cool Practical Peripherals ProClass 288LCD modem on your desk. Its LCD screen displays information such as connection speed, line quality, and more than 100 other messages to let you know why you can't get on AOL. Besides the neat styling and the 28.8 Kbps transfer rate, the V.42bis data compression assures you'll get optimum transfer speed, provided the person on the other end of the line is as smart as you are and has V.42bis too. ProClass 288LCD modem: US$429. Practical Peripherals: (800) 442 4774, +1 (805) 497 4774.

Headmount for Home

Now you can stick your head in cyberspace from the comfort of home, with the CyberMaxx, a consumer-priced VR headmount display. It can be used with all games developed for the PC, Macintosh, Sega, Nintendo, and Jaguar systems, and new games are being designed by the same companies specifically for the headmount. Don't forget to take it off, though, before you drive to 7-Eleven for more videogame munchies. CyberMaxx: US$699. VictorMaxx: +1 (708) 267 0007.

Terminal for Tykes

It's never too early to wire your children, and the Pico interactive book player is a great way to get them started. This colorful plastic toy from Sega hooks up to your TV and runs Pico story and game cartridges. Kids love to use the blunt stylus to lead them through each page of interactive and educational stories. Best of all: they'll think they're just playing a game, though they'll really be training for a future of 40-hour weeks in front of a computer. Pico: US$160 (includes one story title). Sega: (800) 872 7342, +1 (415) 591 7529.

The Star-Off Machine

Dr. Seuss's Sneeches with "stars upon thars" would love the Redfield Infrared Coagulator, a tattoo-removal device to make Sylvester McMonkey McBean proud. Up till now, erasing a tattoo often resulted in a scar that looked even worse than the original offender. The Coagulator uses infrared energy to penetrate the skin and remove pigment from the top 0.75 mm of tissue. It doubles as a handy hemorrhoid zapper, too! What's next – a piercing hole eliminator? Infrared Coagulator Dermatology System: US$3,615. Redfield Corp.: (800) 678 4472, +1 (201) 391 0494.

Info Imp

When I travel, I usually spend an hour or two copying files from my desktop machine to my laptop. I always forget at least one important file. With the Datasonix Pereos, I can stop fretting. This hand-held storage device runs on two AA batteries and plugs right into the computer's parallel port. I can dump the entire contents of my 600 MByte hard disk (1.25 GBytes of compressible data) onto a single postage-stamp-size digital tape cassette in just six seconds, stash the Pereos in my briefcase, and travel with confidence. Pereos: US$595. Datasonix Corp.: (800) 328 2779, +1 (303) 545 9500.

Pressure Drop

The last person you can trust (other than politicians, preachers, and used car dealers, of course) is the TV meteorologist. That's why I have my own BA–212, a digital barometer that predicts the next day's weather conditions with 75- to 80-percent accuracy. The barometer also has an alarm that sounds when a storm is about to hit, giving you time to run down to the bomb shelter and start eating Spam until it blows over. BA–212: US$89.95. Oregon Scientific Inc.: (800) 869 7779, +1 (503) 639 8883.

OUR BOOTS CAN HANDLE A MOUNTAIN STREAM.

Get the Edge

No matter how smart technology gets, nothing beats playing videogames against a human opponent. The Edge 16 lets two people play Sega Genesis games over regular telephone lines. Even neater – the players can curse one other over the same line that their gameboxes are using to swap data. The Edge plugs into the Sega Genesis game slot and includes a phone jack speaker. (Heads up: you need special game cartridges designed for the Edge.) Edge 16: US$150. AT&T Corporation: +1 (404) 853 2959.

Home Office Hub

The AST Advantage! Adventure 4000 series will have callers believing your back room is a big company. This 486 computer acts as a full-time receptionist by answering the phone and taking messages. Techno-sadists will have fun sending callers into voicemail hell with its 99 mailboxes. Frequent travelers will like the ability to call their Adventure to retrieve and forward faxes. There's even a speech-to-text function for obtaining phone numbers and addresses remotely. Advantage! Adventure 4000: approximately US $2,000. AST Research Inc.: (800) 876 4278, +1 (714) 727 4141.

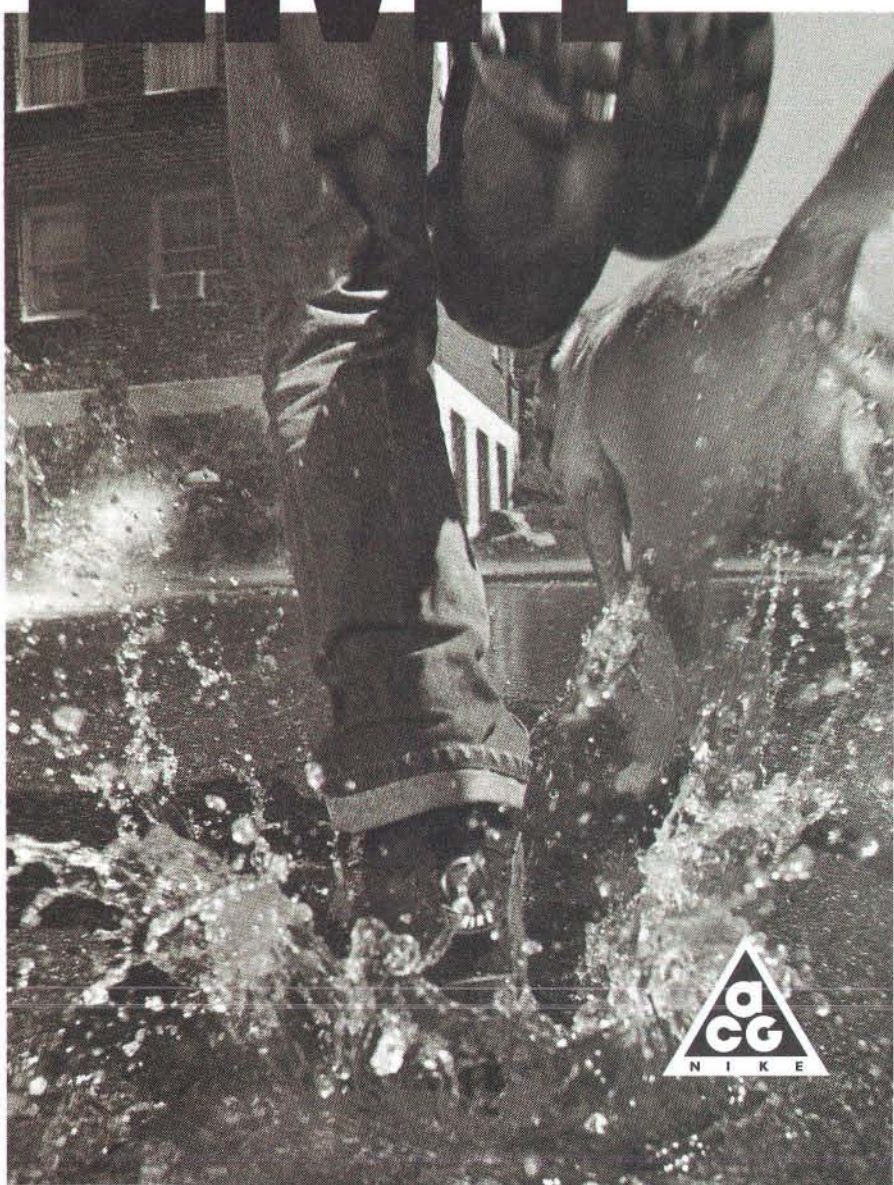
Get Real

Sound Retrieval System technology restores the proper frequencies and proportions of direct and indirect sound waves in recordings to re-create the experience of a live performance. NuReality has incorporated the technology into small devices that connect to the audio output of PCs, videogames, and stereo systems. The result is richer, deeper sound for your games and CD-ROMs. With the Vivid 3D there is never a fight over the audio sweet spot, because you get the full effect of 3-D sound from every part of the room. Vivid 3D series: approximately US$79–$149. NuReality: (800) 501 8086, +1 (714) 442 1080.

Court Radio

Don't you hate it when you've got to get to work but your favorite celebrity is facing a jury on national TV? Don't despair! The Telemate will keep you dialed in. It combines a miniature radio transmitter with a special TV tuner that isolates the sound portion of TV broadcast signals. Just place it near any standard FM radio and use the digital tuner to catch the audio portion of your favorite TV show. Telemate: US$59.95. Econologic Technologies Inc.: +1 (415) 843 6800.

CAN YOURS HANDLE THE CHICAGO WATER SYSTEM?



The Future of Drugs

You've heard the hype. We asked the experts. Here's the *real* timetable.

Marijuana has, by some accounts, become the number one US cash crop, cocaine has become crack, and LSD has celebrated its golden anniversary. Millennia after shamans began experiencing drug-induced trances, a war on drugs rages in most countries. While Steve Dnistrian, vice president of the Partnership for a Drug-Free America, thinks drugs will be decriminalized only "when we decide genocide is a good idea," many drug experts think a "just say know" attitude is better for developing a viable harm-reduction drug policy.

Wired* asked five experts to predict when using drugs will no longer warrant free accommodations in prison and when the next wave of mind-altering methods may be available for experimentation. – *David Pescovitz

	Smart Drugs	Prohibition of Tobacco	Dial-A-Mood	Decriminalization of Drugs in US	"Sober-Up" Drug
Michael Aldrich	2050	2050	2040	2050	2050
Timothy Leary	2000	never	1994	1994	1996
John Morgan	1994	never	3094	2014	2009
Alexander Shulgin	1994	1998	2000	1996	2000
Andrew Weil	2010	never	2000	2000	2050
Bottom Line	2010	never	2225	2010	2020

Michael Aldrich, PhD
Curator, Fitz Hugh Ludlow Memorial Library

Timothy Leary, PhD
Philosopher

John Morgan, MD
Professor of Pharmacology, City University of New York Medical School, member of the Advisory Board of the Drug Policy Foundation

Alexander Shulgin, MD
Chemist/Pharmacologist, University of California at Berkeley; coauthor of *Pihkal: A Chemical Love Story*

Andrew Weil, MD
Author of *From Chocolate to Morphine*, and *Natural Health, Natural Medicine*.

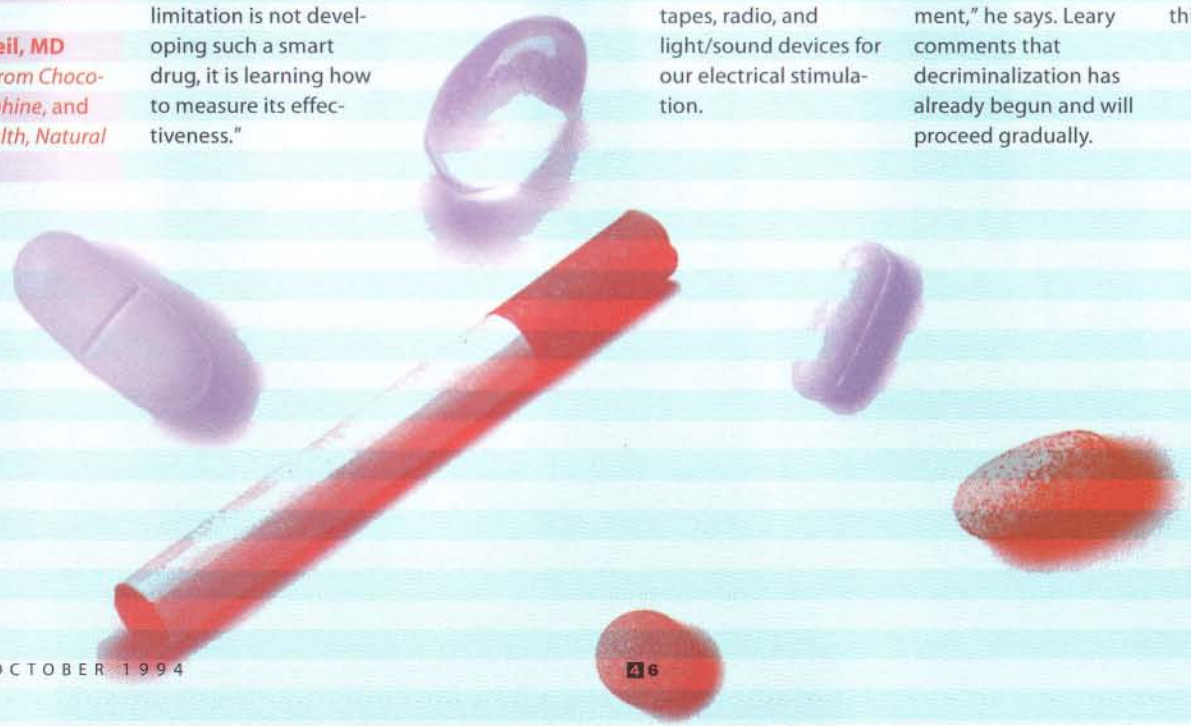
Certain "smart drugs," like Piracetam and Deprenyl, are used by some physicians to treat Parkinson's disease and memory disturbances, but the debate continues about their effectiveness on the average person. Most of those polled agreed that, although a "smart pill" may be just around the corner, the IQ test is an outdated gauge of intelligence. Morgan speculates that amphetamines may increase IQ scores. Shulgin thinks "the limitation is not developing such a smart drug, it is learning how to measure its effectiveness."

Even though the courtrooms are full of anti-smoking advocates during lawsuits against tobacco companies, don't plan on auctioning stale Marlboros to the highest-bidding addict anytime soon. Still, Aldrich, Leary, and Weil expect smoking bans to increase until extinguishing your butt in public won't be just the neighborly thing to do, it'll be the law. But private use, Leary and Weil agree, will never be illegal.

Morgan thinks the stimulation must be delivered from inside the brain's limbic system, where sensory integration occurs, so a nanosystem would have to be implanted in or delivered to the nucleus accumbens (inside the limbic system), where the pleasure center is thought to be located. Shulgin speculates, "Such a device will go the prohibition route of the Orgone box." Leary, however, notes that we already turn on TV, audio/visual tapes, radio, and light/sound devices for our electrical stimulation.

Shulgin thinks that "the speed of the erosion of our rights and freedoms is such that if decriminalization does not occur in a couple of years, it cannot occur" until some form of revolution takes place. Aldrich feels that decriminalization of currently illegal drugs depends on what new drugs are developed and how well society accepts them. "Prohibition of drugs accepted by millions of users is impossible without totalitarian enforcement," he says. Leary comments that decriminalization has already begun and will proceed gradually.

According to Aldrich, "reversing (the effects of alcohol) could be as simple as discovering the neurochemistry of how alcohol produces its effects, or as complicated as parsing the variables of setting, genetics, chronic use, and dose-responses." Morgan agrees the problem is "finding the correct cells and the correct receptors or membranes that mediate intoxication." Leary says wistfully that Sunday morning wouldn't be too early for the invention of this drug.



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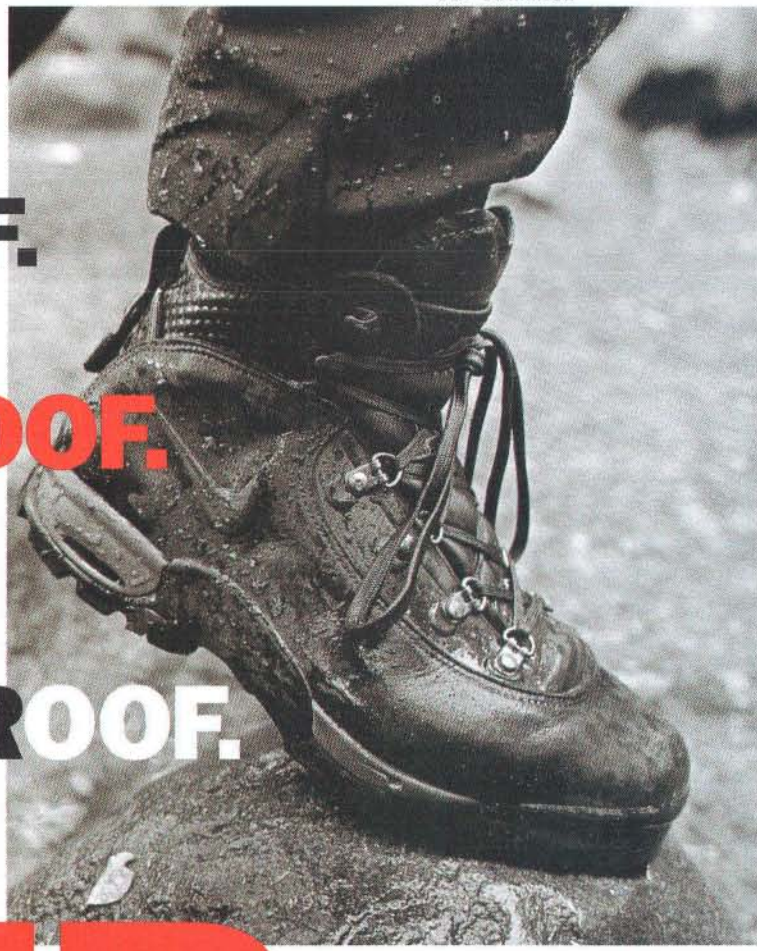


ACG MEANS ALL CONDITIONS GEAR AND ALL CONDITIONS MEANS ALL CONDITIONS.

What's Up. What's Next.

RAW DATA RAW DATA RAW DATA

INDUSTRY GROUP INDICES

Investors fell over themselves to buy stock in communication companies, but enthusiasm cooled somewhat toward the end of the year as doubts grew about how many players the market will be able to support.

SEMICONDUCTOR BOOK-TO-BILL RATIO

This key indicator for the semiconductor industry typically dips midyear. A book-to-bill ratio of 1.04 means that for every US$100 in chips shipped, the industry got $104 in orders.

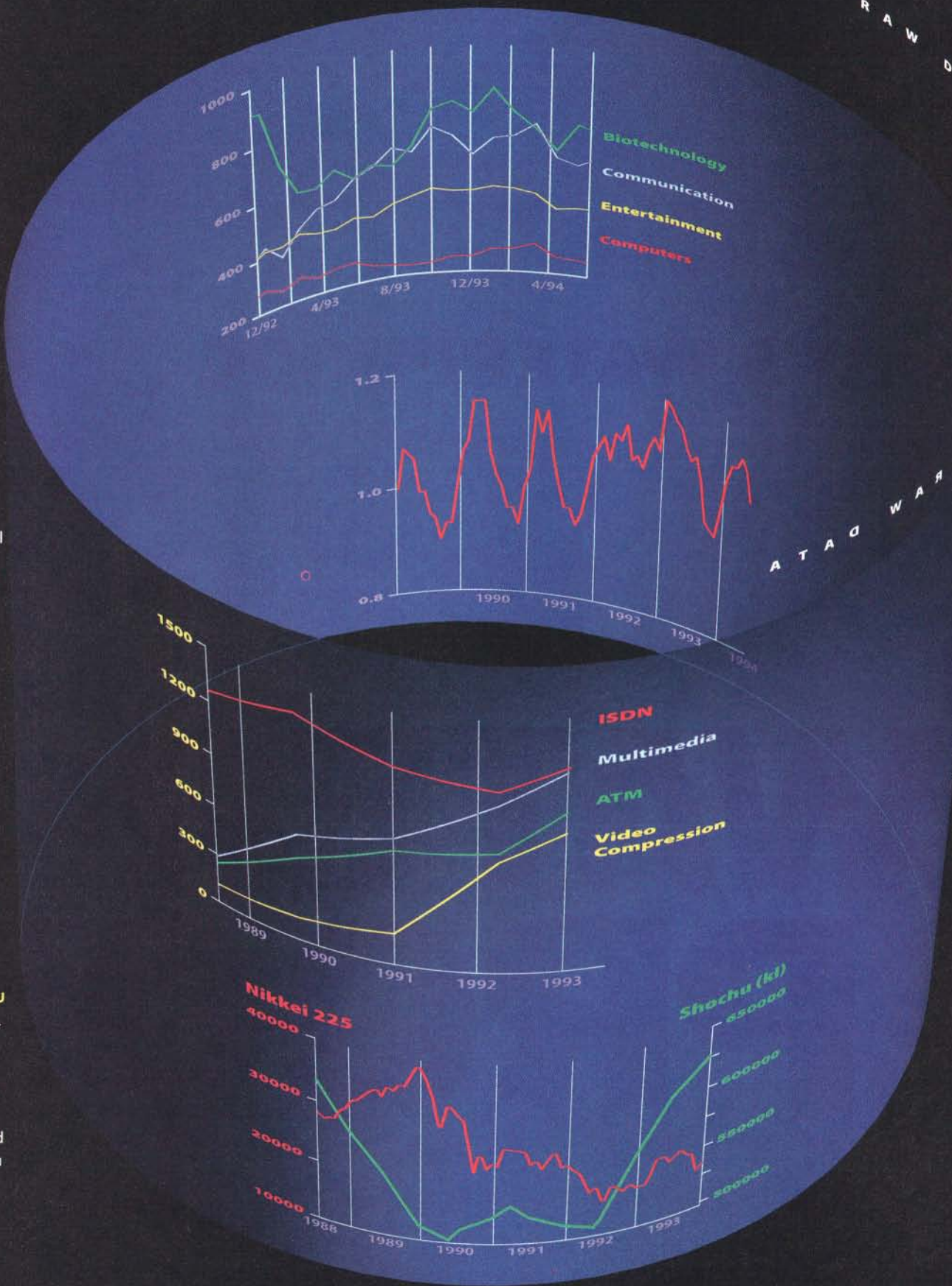
SCIENTIFIC RESEARCH

Scientists are rushing to solve the technical problems facing the information highway. The number of technical journal papers requested about ISDN had been falling since 1990, only to swing upwards last year.

NIKKEI VS. SHOCHU

In the 1980s the Japanese drank imported scotch, but with the economic belt tightening, many consumers are now turning toward cheap and fiery Shochu to drown their bear-market blues.

– Steve G. Steinberg



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Billions Registered

Right now, there are no rules to keep you from owning a bitchin' corporate name as your own Internet address.

By Joshua Quittner

I'm waiting for a call back from McDonald's, the hamburger people. They're trying to find me someone – anyone – within corporate headquarters who knows what the Internet is and can tell me why there are no Golden Arches on the information highway.

It's true: there is no mcdonalds.com on the Internet. No burger_king.com either.

Yet.

Hey kids! Check out the super contest on page 56!

"Are you finding that the Internet is a big thing?" asked Jane Hulbert, a helpful McDonald's media-relations person, with whom I spoke a short while ago.

Yes, I told her. In some quarters, the Internet is a very big thing.

I explained a little bit about what the Big Thing is, and how it works, and about the Net Name Gold Rush that's going on. I told her how important domain names are on the Internet ("Kind of like a phone number. It's where you get your e-mail. It's part of your address."), and I explained that savvy business folks are racing out and registering any domain name they can think of: their own company names, obviously, and generic names like drugs.com and sex.com, and silly names that might have some kind of speculative value one day, like roadkill.com.

"Some companies," I told Jane Hulbert, "are even registering the names of their competitors."

"You're kidding," she said.

I am not, I told her, recounting the story of The Princeton Review, the Manhattan-based company that sells SAT prep courses, and how it registered the name of its arch-rival, kaplan.com. Now the lawyers are working it out in court. Very ugly. (We'll get to that later.)

"I could register McDonald's right now," I said, pointing out that the name is still unclaimed.

"You could?" she asked, then quickly answered my silence: "You could."

"So could Burger King," I said, and Jane Hulbert rang off, looking for some MIS person with the answers.

How much do you think mcdonalds.com is worth? What could you sell mtv.com for? Is there gold in them thar domains, as a lot of people seem to think, or is it just fool's gold? No one knows the answers to these questions, though they are being asked, very pointedly, in federal court, as well as in the boardrooms of a number of the nation's biggest companies.

In the meantime, a frenzy of domain-name registration is going on at the InterNIC, or Internet Network Information Center, the agency that assigns domain names and rules on requests. It's easy to find an unused domain name, and so far, there are no rules that would prohibit you from owning a bitchin' corporate name, trademarked or not.

The InterNIC staff has neither the time nor the inclination to scrutinize your application. Not too long ago, I spoke to Scott Williamson, the person who supervises InterNIC registration, to find out what criteria the InterNIC uses to deny registration requests.

There are situations that raise two red flags, according to Williamson: "If the name's already taken. Or if we catch an 'obvious one.'"

An "obvious one," he explained, is a blatant attempt to register a name to which you're not entitled. For instance, let's say Sprint Communications wanted to register MCI, a competitor in the long-distance telephone biz. That would be an "obvious one" that even the beleaguered staff of the InterNIC would pick up. But wait a second! In the spring of this year, Sprint *did* register the call letters MCI, albeit briefly. For a while Sprint owned mci.com.

Why did Sprint want to register its rival's name as a domain name? Sprint won't say, exactly: "For the record, Sprint won't discuss its plans for the domain name," said Evette Fulton, a spokesperson, who added, for anyone too dumb to read Sprint's lips, "We're in an extremely competitive business." As soon as the InterNIC got wind of it a week or so later, mci.com was re-registered to MCI.

How did such an obvious one get by InterNIC?

"It was a fluke," Williamson said, noting that three requests for the domain name, mci, came in almost simultaneously. (One request was from MCI itself, one was from Sprint, and one was from another company whose initials were MCI.) "All three came in, and the guy in registration registered the wrong one."

The guy in registration? One person is responsible for assigning domain names on the Internet?

Actually, "We have 2.5 people doing it," Williamson

I could register mcdonalds.com? "There is nothing that says I can stop you from doing that," Williamson said. "We really need some policy."

said, meaning that the half person is really a full person doing it part-time. Or something. Regardless, 2.5 humans is not enough people, or parts of people, to do the job. (Would one person be assigning quit-claims to a gold rush?)

Williamson said that a year ago, his agency received 300 requests a month for domain names; now, more than 1,300 requests stream in each month.

Clearly, the InterNIC can't research every one of those names for trademark violations. "If we had to research every request for a domain name right now, I'd need a staff of 20 people," Williamson said. So the policy is simple: "Trademark problems are the responsibility of the requester."

Which means, I asked, that I could register mcdonalds.com?

"There is nothing that says I can stop you from doing that," he said. "We really need some policy."

"The problem with the Internet is, who's in charge?" he added wryly. "When we figure that out, there will be a meeting."

But even if the InterNIC figures out some mechanism to more effectively weed out bad-faith registrations, it can't go around protecting trademarks. That would be too time consuming and would be beyond the scope of its responsibilities.

The situation is analogous to incorporating a company to do business in a particular state, explained Bruce Keller, one of the country's top trademark attorneys, at the white-shoe Manhattan law firm of Debevoise & Plimpton. While I was waiting for McDonald's Hulbert to call me back, I spoke with Keller on the telephone.

Keller, who is counsel to the International Trademark Association, said that "when you incorporate a company in a state, the state doesn't bother to see if there are other conflicts with trademarks that may be registered in other states – it just checks with the secretary of state to see if the same name has been registered." This is the same function, in effect, that the InterNIC performs. If a name hasn't been registered, you can take it, he added, but beware: "That in no way entitles you to use the name if in fact there is a conflict with a federally registered trademark."

It's no different in cyberspace. Keller's advice to anyone registering a domain name is to do a careful trademark search, just as you would before incorporating a business. "In my view, it's trademark law pure and simple."

Trademark law, he explained, offers two general kinds of protection. In the first instance, protection from infringement, when a customer associates a certain name with a certain product or services, the law prevents others from using that name and creating confusion. You see the name, "McDonald's," and what do you think of? (Quarter Pounder with cheese, medium fries, and medium Coke is what I think of; you can name your own poison.) The question is, Would most people expect to find some connection to fast-food hamburgers in cyberspace when they finger mcdonalds.com? Keller says yes. Trademark protection has to extend from the physical world to the virtual world.

The second kind of protection seeks to prevent trademark "dilution." "Trademarks are valuable corporate assets. You can put a price tag on them," Keller said. "Coca-cola, for instance, has a multibillion-dollar value." If someone else attempted to use that name – as a joke, for instance, or to be cute – the value of the trademark would start to dilute. "This protection comes into play when someone takes the word 'McDonald's' and sticks it on a mailbox" – as in a domain name. "McDonald's is among the most aggressive companies in stopping use of its name. It goes after everybody, whether it's a dentist calling himself 'McDental,' or a motel calling itself 'McSleep.'

That, conceivably, might even bar you from using a domain name such as bigmac.com.

Trademark infringement cases are usually settled through a process I've come to think of as Big Footing. The big company with the trademark Big Foots the little one, forcing it to give up the name. Usually, this is achieved with a Big Foot letter from the big company's lawyer, threatening legal action.

McDonald's does it. So does *Wired*. Last year, WIRE, a computer network encouraging women to get on the Net, registered the domain name wire.com. This magazine's lawyers sent them a Big Foot letter: "That sounds too much like *Wired*'s online service, wired.com. Give up the name, or else." WIRE became Women's Wire, and retreated to the domain name wwire.com.

Most trademark infringement cases never get beyond the Big Foot letter. "This is going to cost you a lot of money if you want to fight it – that's the way the bulk of cases are settled. Who wants to waste time fighting it?" said Keller in an obviously rhetorical question. Keller's firm is local counsel in the Kaplan versus The Princeton Review case, a good example of someone who wants to fight it.

And here's another: Anyone ever hear of Adam Curry? In June 1993, Curry, then an MTV video jockey, registered the domain name mtv.com with the InterNIC, "partly because it was a cool address to have, and it was available," he wrote, in an electronic message that was hard to miss if you were on the Net this past May.

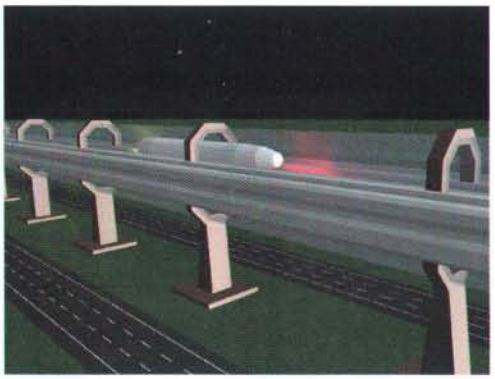
Curry hung his own computer on the Internet and put up a gopher site, which offered, among other things, a daily entertainment "Cybersleaze Report" and "Adam Curry's Brain Waves," providing Curry's own spin on the rock and roll scene. He paid for the site himself and considered it kind of a hobby. He said he told his bosses at MTV what he was doing and encountered no resistance.

Then, in April, Curry resigned from MTV. He was promptly sued for copyright infringement stemming from his ownership and use of mtv.com.

MTV's lawyer asserted that the case would be fought on traditional trademark infringement grounds.

But Curry, who has agreed in the meantime not to use the domain name mtv.com "in a confusing manner," said mtv.com is

SHOW.



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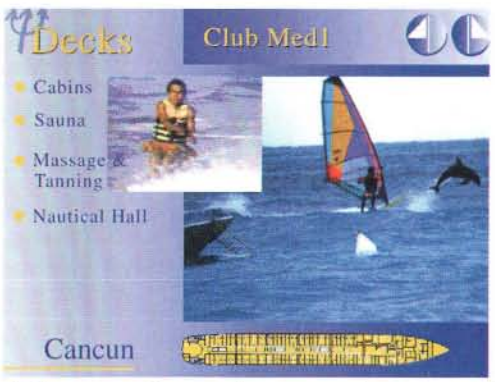

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his property, and he's not relinquishing it. Until the court battle is resolved, Curry is maintaining a site called metaverse.com. In other words, while he might not use the name, he intends to keep it and not transfer title to MTV.

"I will fight this all the way," he said, adding that the case would be the "*Roe v. Wade* of the Internet and the information superhighway. There is just no way that MTV has the right to my address. It's my address. Mine."

Curry said his site has become exceptionally popular on the Net and has received millions of visits. Indeed, his lawyer, Joe Donley of the Manhattan firm of Shereff, Friedman, Hoffman and Goodman, said that Internet users have come to associate mtv.com with Curry alone.

"We believe that if they were allowed to take Adam's mtv.com address and use it for themselves – now that Adam has shown what a useful service this could be – there's a very real danger of reverse confusion," Donley said. "Millions of Internet users have come to associate mtv.com, not with MTV, but with Adam. If they go out and take the domain name, it will leave those millions of people with the potential to be confused."

One way around this problem would be to compensate Curry for his efforts, of course. Would Curry be willing to sell mtv.com to MTV? I asked.

"There are things going on that I cannot comment upon," said Donley. And he didn't.

John Katzman is another guy whose company registered a domain name that is prized by someone else: kaplan.com. Katzman is president of The Princeton Review, a company that provides courses and workbooks to prepare students for standardized tests such as the Scholastic Achievement Test. The Princeton Review's main antagonist is Kaplan Educational Centers, which goes a long way to explaining why Katzman's company might see a strategic advantage in registering and owning kaplan.com.

Katzman said his company decided to launch a site on the World Wide Web "that explains to people the difference between Princeton Review and Kaplan.... We decided to call it kaplan.com."

Doesn't that domain name make it sound as if the site is maintained by Stanley Kaplan? "Our position is that the name of the site is descriptive of what's on the site, which is an analysis of the different courses," he said.

Kaplan's former president, Greg Rorke, doesn't see it that way at all. Around January, Rorke's people met with representatives of The Internet Company Inc., which helps businesses get on the Net, and looked into the possibility of registering a kaplan.com domain name. "We figured there was no hurry," Rorke said, adding that it came as quite a shock when someone in Kaplan's technology department found out a few months later that Princeton Review had registered kaplan.com.

Kaplan fired off a Big Foot letter, and initiated legal action that went to US District Court in Manhattan, the same courthouse-arena, by the way, where the Curry-MTV bout is being fought.

Katzman said he intends to hold onto kaplan.com, unless the court tells him otherwise. In the meantime, he said, Kaplan is more than welcome to find its own, unused name and, "if they want to link it from our server both ways, we'll do it."

While awaiting McDonald's call back (I called Jane Hulbert and was informed she was on the other line), I started playing the Whois Game. The Whois Game tells you who, if anybody, owns what domain name. For instance, I found out that there *is* a god, at least on the Internet. (god.com is registered to Guaranteed Online Delivery in Cambridge, Massachusetts.) There's also plenty of sex and rock, if not roll. (Sex.com is registered to Online Classifieds Inc. of San Francisco, and rock.net is registered by Rocknet of Cupertino, California.)

From most Unix Internet shell accounts, you can easily play the Whois Game. From your shell prompt just type, "whois <domain name>".

If you type *$whois nbc.com*, within a few seconds the InterNIC registry will be fingered and you'll see:

National Broadcasting Company Inc.
(NBC-DOM)
30 Rockefeller Plaza
New York, NY 10112

plus some other administrative stuff that meant little to me but would probably help a system administrator, lawyer, or someone who spends far too much time in front of the computer and ought to get out more.

While NBC also has an Internet e-mail address for *Nightly News*, the other three networks haven't even registered their domain names.

But other people have: as I write this, abc.com is registered to ABC Design in Seattle; cbs.com is registered to a consultant in Golden Valley, Minnesota; and fox.com is registered to something called the Flexible Online eXchange, in California. (I couldn't believe that Fox hadn't figured it out. I mean, the Internet was mentioned on an episode of *The Simpsons*, and Rupert Murdoch was smart enough to grab Delphi, the national Internet gateway service. Fox does, in fact, maintain an address at delphi.com, through which viewers can offer feedback.)

The Whois Game is an interesting gauge of who is paying attention to the Big Thing known as the Internet.

In May, I asked a researcher at *Wired* to check the list of Fortune 500 company names against registered domain names and found that only one-third of the Fortune 500 had registered an obvious version of their names. More telling was that 14 percent of America's largest corporations had their net.name snapped up by someone else.

That left more than 50 percent of the Fortune 500 names still available to first-comers. The top 15 companies all had their act together and had registered their domain names. But some other very big companies did not. Those include: Nabisco, Sara Lee, Anheuser-Busch, Kellogg, and Coca-Cola, or even Coke. Ooops. That was just nabbed as I write by one Rajeev Arora in Campbell, California. Way to go, Rajeev! The Pepsi generation, presumably, is more wired, since pepsi.com is registered. A John Sculley legacy?

Of course, some companies were on the Net with nonobvious, unhip addresses at places like America Online and Prodigy.

What will these companies do when they attempt to move onto the Net and reclaim

My fingers trembled, as if ripping open a Big Mac.

***$whois mcdonalds.com* brought up:**

Domain Name: MCDONALDS.COM

Administrative Contact: . . .

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their names? Draft Big Foot letters and lawsuits, I guess.

Which made me think of Jane Hulbert, at McDonald's. I called her again and we finally connected.

She was very apologetic. "I don't have anything for you, and I probably won't have anything for you," she confessed. "I've left a lot of voicemail for people, but no one seems to know anything about it."

Jane Hulbert said she'd keep checking around, but she didn't seem hopeful that we could get to the bottom of this domain-name thing. "You'll probably just have to do your story without it," she said. "It probably won't be the end of the world."

She's probably right. I wondered how long it would take 2.5 InterNIC people to process my application for mcdonalds.com.

Not very, it turns out. About two weeks later, after filling out the Net-available domain-name application form, I got e-mail notification from domreg@internic.net:

"Registration for the domain MCDONALDS .COM has been completed. The InterNIC database has been updated.... The new information will not be visible via WHOIS until the next business day...."

My fingers trembled, as if ripping open a Big Mac. I checked:

$whois mcdonalds.com
Domain Name: MCDONALDS.COM
Administrative Contact:
Quittner, Josh quit@newsday.com

Oh, that's McCool. I feel like McPrometheus. I have stolen McFire.

I need to get comment from someone. But who?

For weeks now, I've been trying to get McJane on the phone, to let her know that I have their name registered if they need it. One week, she's out on vacation. For two others, she's on another line.

Is she avoiding me?

"Can anyone else help you?" someone asks. Yes, I tell her, explaining all over again about the Internet, domain names, the Gold Rush, mcdonalds.com. Still, no one returns my calls. Hamburgers are what makes this country great. Burgers are the backbone of our economy. It's not so far-fetched to think that McDonald's would be out there on the Net; ISDN, after all, was first used commercially by McDonald's. Also, McD's was expected to perform an online first in August on America Online with a 30-second commercial. I've even heard that the Golden Arches is experimenting with delivery service. What better way to order your Big Mac than over the Net? Over 25 million users served....

This callous indifference to the Internet worries me. Will the Japanese catch on?

Isn't there someone in burgerland who cares?

Hold the pickle, hold the lettuce. You can have it your way, at Burger King!

As I said, there's no burger_king.com either. Still, Burger King seems reasonably wired. The person who answers the phone in communications even has a vague idea about what the Internet is. ("Some kind of information thing, like Prodigy?" she asks. "Yes!" I tell her. "OK, but what does that have to do with Burger King?" she asks. Exactly.) I'm routed to some guy who promises to look into the matter of domain-name registration. A day later, he leaves me voicemail: "I don't have a definitive answer on the Infonet registration," he says. "The closest thing I've got for you is *We are considering it.* But no decision has been made." I'd like to ask him more. Hell, I'd like to see if Burger King is interested in *buying* mcdonalds.com, taking it off my hands, but his message says he will be out for a week or so.

The fate of mcdonalds.com is in your hands!

What would *you* do with mcdonalds.com? Send your idea to *ronald@mcdonalds.com.* Really. We're not kidding!

So here's the deal: Let's get interactive. What should I do with mcdonalds.com? You tell me. I could auction it off. I could hold on to it as a trophy, à la Curry and mtv.com. I could set up a Mosaic home page, explaining the difference between McDonald's and Josh "Ronald" Quittner.

Got a suggestion? Send it to *ronald@mcdonalds.com.* ■ ■ ■

Joshua Quittner covers cyberspace for Newsday. *He's the co-author of* Masters of Deception: The Gang that Ruled Cyberspace, *to be published by HarperCollins in January. Andrew Rozmiarek conducted research for this piece.*

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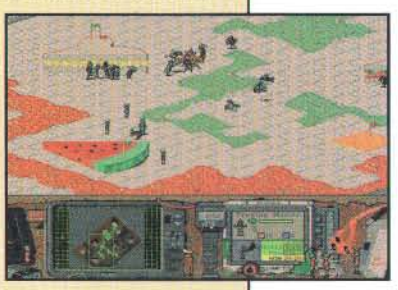

Will your armada of spiders cross the cola lake in time to save the flag? Will the suicide run of a kamikaze mosquito take out the praying mantis? At what cost? What price victory?

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Press "2" for a Lover

Jennifer Cowan goes voicemail dating only to discover . . . she wants to reach out and touch someone.

Sooner or later it was bound to happen. I mean, I'm hyper-sociable and I adore the phone, so combining the two to meet men was pure serendipity. Thank God someone was clever enough to invent telephone date lines. But first, I needed a way to avoid the stigma attached to cruising the personals – I couldn't be such a loser that I'd resort to the ads for action. (Not to mention a real relationship.) I needed a reason beyond "It's a great way to meet guys." I mean, c'mon: so's playing hockey!

When a friend (and voicemail dating convert) suggested I do a story on it, I pounced. After all, I was a producer for a show called Media Television, and the phone is a medium. I had legitimacy. I could venture safely into telephone-land, check out the inhabitants, frolic, and still escape as the cool, slightly wanton babe that I am – all in the name of social science! Besides, Toronto, my home base, is the birthplace of voicemail dating.

I could venture safely into telephone-land, check out the inhabitants, frolic, and still escape as the cool, slightly wanton babe that I am – all in the name of social science!

Armed with my phone and the alternative Toronto weekly *Now*, I sprawled across my bed. Zillions of voicemail personal services beckoned, with their taunting whispers of "Hey ya big loser, ya social reject." The personal ads became a dare from hundreds of long- and short-haired men and women, who flew planes, skied, cycled, and played piano. They were university-educated, fit, financially secure, into alternative music, attractive to their peers, and *all* seeking friendship and possibly more. Why were all these fabulous souls single? Then again why was I?

I opted for Telepersonals. The name was focused, they had 200 ads at a glance, and it was *free* for women. (It's free for both men and women to listen to ads or record their own, but men pay about 35 cents a minute to send and *retrieve* messages.) Strange, though: I wouldn't be caught dead patronizing bars proffering ladies' nights, but here I was, gunning to dive into an electronic snake pit.

"Welcome to Telepersonals!" The recorded voice was female, cheerful, and freakishly reminiscent of the Stepford Wives; the background music was perky and electronic. In that oddly human, robotic tone, the voice succinctly mapped out the elaborate system of options and prompts. "Regular callers press 1, first-time callers and more information press 2." Then: "Male callers press 1, female callers press 2." Each button on my phone suddenly offered an adventure: I could listen to other members' ads, record my own, get tips on safe dating, pick up messages, and leave suggestions or testimonials. I quickly realized that my cordless was the wrong model for this operation. A regular touch-tone proved much more efficient for simultaneously listening and zapping through the menu with race-car precision.

The fembot told me that to receive or send messages, I would need a personal voicemail box and passcode. Plus, I had the option of recording an ad. But what to say? Confessing I was researching a story was probably a tad too direct and exploitative. Yet conscience dictated a truthful image. With a confident, bombastic blast, I took the plunge.

"Hi this is Carmen, at box 3131." (OK, so I used a pseudonym. But everything else was true.) "I'm 28, 5-foot-10, 135 pounds, with brown hair and green eyes. I've been told I'm spontaneous in a planned kinda way. I have a wild side tempered by my pragmatic side. I ski but not on little hills and can be a bit of a rock pig – or get into opera. I'm a leftie and I like men who are intelligent and funny, so if you're older or younger, but not shorter, then tell me about your last adventure in another time zone."

It would take a day for my ad to be approved – to ensure I wasn't cussing or soliciting. Service reps boot offenders off. But since Telepersonals offers categories like "intimate encounters" as well as "long-term relationships," salacious suggestions are OK, if the choice of words is imaginative and demure rather than guttural and literal. Once approved, I could open the floodgates and bathe in a sea of pithy, enlightened conversation, and maybe . . . just maybe . . . Nah. This was research after all, and putting too much stake in it would be like getting excited about a blind date.

Since I was already online, having slogged through the options, I decided to peruse the pickings. Punching the * key took me into BoxTalk, the most interactive option. It runs the ads of everybody on the system at that moment. I could leave men messages in their voicemail boxes and since they would be transmitted instantly, await their responses. (It's sort of like an AOL chatroom, only better,

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since verbal deftness comes easier than quick typing and online etiquette.)

First, I had to record a temporary greeting so they could suss me out. I considered swearing like a pirate to see if big sister would catch me, but instead I repeated my ad.

I cruised through the BoxTalk menu, marveling at my new dexterity. Anyone who opened his ad with "hello ladies" or "I'm looking for a girl" was quickly excised by pressing the number 3. Men who spoke in breathy bursts – or insecure mumbles – were outta there before they could sputter their vital statistics. I lingered on the bold, sharp-witted greetings, only to be interrupted by the Stepford voice; "you have a message from box 3716. To listen to new messages, press 1." Less than five minutes on line and I was eliciting responses! Minutes later, I found myself deluged.

A man named Micron, who ate heavy metal bits and came from some faraway planet, intrigued me more than the seemingly endless selection of very athletic, extremely attractive, positively banal men who tried to lure me with promises of candlelight dinners and walks on the beach. Like I was looking to live in a romance novel; *Melrose Place,* maybe, Harlequin, no way. I sent Micron a message as "Judy Jetson" and asked him to tell me a secret. He said he dug my clothes, had gone to a costume party dressed as a woman once and... really got into it. I told Micron he sounded swell, but I was terribly territorial about my wardrobe.

Blake was a rocker with dirty blond hair and a dirty mind. I asked him what the last book he read was. His response: he didn't read much.

OK, if people were going to be like that, I'd deal with the ones who spelled it out. Blake was a rocker with dirty blond hair and a dirty mind. I asked him what the last book he read was. His response: he didn't read much.

Shawn seemed deserving of a message. He claimed to be intense, independent, and possessed of a degree in psychology. As I didn't want to hold that against him, and as he had a confident voice and good diction, I sent off a series of questions: last book read, last album purchased, last movie seen. Shawn had just completed Allan Bloom's *The Closing of the American Mind.* Signs of intelligent life. Unfortunately, he was a huge Bryan Adams fan, and his favorite film was *An Officer and a Gentleman.* I told him our tastes didn't seem to be in simpatico; still he assailed me with messages. At some point we had a heated debate about Ayn Rand, after I offended his sensibilities by calling her fascistic. All this in the space of moments, and through the wonders of voicemail technology. I never even *really* talked to him. What a trip!

"I work on my dreams a lot; I love the moon," Todd cooed like he'd just wrapped up a yoga session.

"Todd, to be honest, you sound too New Age for me. I'm ridiculously practical, anal retentive, and totally cool with it." Todd was zen about my excuse.

I was starting to feel like the only woman in a mining town. Offers were being bandied about wildly. "You sound fabulous.... I'm spontaneous, discreet.... You want to chat?... Did you hear the one about.... Why don't

The Couch Potato.

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we get together for hours of passionate love-making?"

It was so liberating! I'm usually so considerate of others, and here I was responding to people willy nilly, with nary a scruple about their financial investment. Damn, I do good phone.

"This is Doug, I'm 43 and divorced. I've never been in another time zone, I'm in the 20th century and I'm looking to meet a younger, attractive female who can get me feeling good about myself again." The tone was labored and weighted with insecurity. I told him I was ugly and he was too old for me. I figured that would end it, but as I meandered through the ads, he flagged me again.

"Thanks for your candor. I might not be the guy for you, but could you do me a favor? I'd like to get your advice on how to meet the girl I want to meet 'cause I'm a male and I don't know how women think and I can use all the help I can get."

I didn't know I'd be enlisted for teletherapy, but gave it my best shot. "Doug, I don't know how *women* think, I know how *I* think and I'm nervous about someone who wants *me* to make them feel good about themselves again. I want them to do that on their own." I hoped he would understand, but I had serious doubts.

Good thing this was a professional survey, not a personal quest.

The following day after work, I hit the phone, anxious to see how my social life was faring in this new milieu. I'd already realized calling from the office was taboo, since co-workers hovering around my desk made it difficult to pick up and send messages. The *research excuse* was getting lame pretty quick.

He peppered the conversation with anecdotes like "when I had long hair and was studying architecture and straddling my older girlfriend."

When I called my voicemail box, there were five messages. I was ecstatic. Ted was an indie film fan and architecture buff. Unfortunately, I was put off by his hesitant, effeminate voice.

Then there was Mark: "I'm 25, 6-foot-2, very well built, long dark hair. I'm a part-time stripper.... Let's get together for coffee. How's that for spontaneous?"

Chris sounded constipated, but said I seemed intelligent and interesting. A sucker for flattery, I took in his ad. He wanted a confident woman with a good sense of humor who liked to shave between her legs. I thought that a moderately gross first impression and told him so. "Gee Chris, you sound nice enough, but if that comment about hygiene was supposed to be whimsical or provocative, then you've got the wrong gal. Thanks for answering my ad, and best of luck to you and your razor."

Ah, yes – and Jay. He was 30, a professional skier, liked my directness and thought I sounded quirky and energetic. Plus, he read books and had a sense of humor. He left me his work number so I wouldn't eat up his time and money on the phone line. (My informal survey of men on the straight services suggests they cough up between $25 and $100 a month to talk to strange women.) But before signing off, he afforded me one small token of information. He was married. I

The Chip.

The secret ingredient of the VCR PRO 4 is a Motorola 68HC05 microcontroller, which makes it possible to run everything without lifting more than a finger. From remote controls to engine controls, products powered by Motorola are fast becoming a way of life.

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decided it was only good manners to respond. With the biggest smile I could muster, I told him, "You are a daring and dangerous person, because for all you know I could be a psychopath who wants nothing more than to call you at home and only at night. But I'm not, and I won't, and I wish you the best of luck in your pursuits." Pig. Who would've known I'd have to specify my quest was for "single men." There seemed to be a whole metalanguage to decipher.

Matthew had just moved from Montreal to Toronto. He was my age, worked in advertising and claimed a tendency to push people away. Understanding the threat of unbridled enthusiasm, I sent him a message with my standard queries. And as luck would have it, he had phoned into the system at the same time as me. I knew this by enlisting the "friend finder." You punch in a box number and the computerbabe tells you if your friend is on the system. His response to the adventure in another time zone was going to Africa with his girlfriend who dumped him afterward. Cool! Matthew left me his number, so I decided to talk to him in real time. Later.

The best talkers didn't give their age. If you punched the keys to uncover their relationship category and age grouping, it was inevitable they'd be over 40. I veered through the ads, amusing myself by designating fellow phonefolk into various categories.

The "freaks and fetishists" popped up now and again, but since my ad wasn't loaded with enough innuendo, I guess, none of them tried to enlist me.

I considered getting off the system, but I had no dazzling plans for the weekend. Five minutes on the line could change that.

There was also this odd tendency to speak in the third person "This 35-year-old..." rather than a simple, "Hi, I'm Joe." It was rampant among the married men and wishful philanderers, as if the disconnected approach to looking for something on the side was OK.

Then there were the "aren't I ironics" whose quests to be irreverent resulted in a series of clichés. "Why do all these ads sound so lame?" "I'm stuck in box 52334!"

I didn't even heed the "inflated egos." I mean, given the line lexicon, it is best to be wary of people who say they are "extremely good looking." Face it darling, all moms say that. Most attractive people, particularly ones with internal beauty, don't harp on it. I used to think so anyway, before I got online.

As for the "sincere, but single," all I can say is, Thank goodness for call waiting or I might miss out on my real life!

A few days later, I met Matthew. We went skating at the outdoor rink at Toronto City Hall. Neutral territory. Matthew and I had shared basic vital statistics: Jamie Lee Curtis would play me in a movie; he'd be whistling "My Girl." Scanning the rink, I spotted desert boots. I had my man. We skated in circles and swapped telemeeting experiences. This tends to be standard when people meet without sharing extended phone conversations in advance. He'd met two women who lived in a low-income housing project and invited people over at all hours of the day and night to play Rumoli.

I told Matthew I was reporting two stories:

Checkout.

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Magellan™ from Spectra-Physics, the scanner/scale that can simultaneously speed-read a bar code on the bottom or any side of an item—a full 360 degrees. And faster scanning means less time purchasing your goods, more time enjoying them.

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one for television and one for a magazine. He bristled. I think he felt like a science experiment. I felt bad. Matthew was nice. My parents would have thought him a mensch. He just seemed to be trying so hard to impress me with his nascent nihilism. Skating in circles, he peppered the conversation with anecdotes like "when I had long hair and was studying architecture and straddling my older girlfriend...." I just didn't want to know about it. Fortunately, he was intuitive enough to realize the chemistry was nonexistent.

"Sorry I didn't ignite your heart," he smiled sadly as he left me standing at the edge of the rink. Hockey was seeming more appealing.

I walked home a little despondent. Here was a decent man, with a similar background and common interests, and it didn't fly. I didn't know whether to give up on the system or gamble on further possibilities. Slipping into bed, I stared at the Kundera novel and phone on the night table. The urge to call in and see if I had messages was overwhelming.

In the next weeks I grew increasingly unable to stay away from the phone. I had replaced my ex-boyfriend's speed-dial ranking with the Telepersonals central number, so checking in was effortless. I was spending up to four hours a night talking to strangers. Part of it was research, but I knew it went deeper than that. To test my own agenda, I'd met a few more people who piqued my curiosity. Usually it was an impetuous coffee date, so emotional energy wasn't wasted. But something didn't jibe. It wasn't that I didn't like Seamus, an Irish artist who resembled Steve McQueen, but his eagerness for something to happen *yesterday* made me flinch. Blair, a real dweeb, was looking for someone to boff and it wasn't me. Sujith, a medical student, shuddered with embarrassment when we discovered we were neighbors. All these men were interesting and tolerable, it's just that the scenario felt too... forced. But even that didn't get me off the phone.

The telephone had become my placebo. How else do you rationalize sitting naked in bed with the phone tucked up to your shoulder?

I realized I didn't want to meet people as much as talk to them, explore who was out there and what they were thinking. I was addicted to covert communication. How else do you rationalize sitting naked in bed with the phone tucked up to your shoulder, pen and notebook in hand, until three in the morning? If on some level I wanted a man in my bed, the phone had become my placebo.

Meanwhile, John, who liked to boink before breakfast, continued leaving messages and extinguishing any desire I ever had to speak to him. One day, I enlisted a new menu option providing the time a message was left. The Stepford voice clued me in: "Monday August eighth, 12:34 a.m.," and "Tuesday August ninth, 7:45 a.m." I cringed, creeped out that a man I'd never met was calling me last thing at night and first thing in the morning. I don't want that kind of responsibility. False intimacy is all this stupid thing breeds.

Sometimes I found myself getting less and less patient and even hostile with people on the line. Yet I couldn't hang up for good. Some

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man called about the type of "girls" he was looking to meet, and rather than just ignoring him, I was compelled to correct him.

"I haven't been a girl since I was 12, and frankly prefer *men* who like *women*."

I was angry, but I refused to believe that ignorance ruled the line. For each bumbling fool, there was an insightful satirist. Every inarticulate boob was counterbalanced by a spectacular commentator. Anyone expecting to find her dream mate should also anticipate her worst nightmare. The phone is hardly a discriminating technovation.

One night, as I put the phone back on the cradle, I started to realize how caught up I was in this. And what about that television item I had to produce? The next day, I sought out Lizanne, my chosen representative of telephoneland's extremes. The undisputed queen of the system, she has four different ads and talks to 200 people each week. Her binders of detailed notes on phone pals and playmates, and her pronouncements like "it's more fun than watching television, because you're communicating with people," convinced me there was someone who spent more time on the phone than I.

She relied on "voiceprints," saying, "when you hear a voice you can ascertain a lot better what kind of person the person is," she said philosophically. "If someone is not eloquent or if they lack finesse or have a whiny voice, you know you're not going to deal with them." Indeed.

Lizanne's popularity on the system can be attributed to two things. She's an excellent listener and doubles as an S/M dominatrix. A serious purveyor of the B/D genre, she's what more demure folk might be inclined to call kinky, attributable to the fur-covered waterbed, the shackles and whips, the assortment of wigs and dildos and weapons in the basement. She is also kind, extremely affable, and socially with-it. Admittedly, I kinda thought she might be a pro, but she busted me on that. She just likes the phone because it's tough to meet fetishists at the supermarket. In more than two years, Lizanne has met over 100 people and created a social club of about 30 who meet once a month to attend everything from Fetish Nights at local hangouts to comedy shows.

Lizanne's popularity on the system can be attributed to two things. She's an excellent listener and doubles as an S/M dominatrix. More demure folk might call her kinky.

"It's a real easy way to safely meet people, be able to determine mutual interests and personality prior to meeting. A lot of nitty-gritty gets taken care of then and there. Meeting becomes the simple part, if the charisma isn't there then, you'll just become friends."

Of course, it did take her some time to find her way. The first man she met was living in a phone booth. The next, though not homeless, was rotund, bald, and didn't meet her aesthetic standards. Number Three was attractive and employed, but lived in California. She eventually managed success with Number Four, a man she's been seeing for the past 15 months. And while the people who run the system don't keep stats on success rates, Lizanne does. Among friends whom she's encouraged to try the service,

The Action.

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she has midwived two marriages, two cohabitations, and two engagements.

Lizanne renewed my faith yet again. She suggested I pop my head into Speakeasy, another free-for-women service, with temporary voicemail boxes to encourage quick conversations or, should you feel inclined, pickups. It's marketed as an electronic bar and operates like the BoxTalk option on Telepersonals, only it's louder. Music and dissonance drone in the background to give a nightclub aura. If only they could pipe cigarette smoke through the receiver, you might actually believe the ruse. When I called in, a bartender named Sam asked me to record my pickup line, and for the next hour or so, an assortment of men slipped notes under my drink. Unfortunately, most of the men I passed messages with behaved the way they're conditioned to in real life situations. Imagine how excited I was to be slipped a note by Harry asking me if he could buy me a drink. How innovative! Of course, it was a hell of a lot easier to ignore him in my little phone world.

Others, like Madcap, were big on swapping Michael Jackson and John Wayne Bobbitt jokes. Lazslo asked if I were Spanish, unaware that my nom de phone was just a tribute to Carmen Miranda. Karl was a reformed alcoholic who found frolicking in the mock bar good for his sobriety. He was anxious to meet for coffee, but I just wanted to goof around in the electronic world. I slipped him a note, "Karl, I am on a self-indulgent, highly experimental bender, so I'm definitely not the gal for you."

Men were always thanking me for my candor. Must be a whole lot of dishonest bitchy babes calling in.

I fidgeted with the phone, inadvertently prompting the menu to slip me into the bathroom. This option lets you take a breather and reassess your pickup message without hanging up. The idea was novel, but I was disappointed they didn't embellish it with running water or toilet-flushing sound effects. When I reemerged, freshened up and ready to leave, I found a note under my drink from Karl. "Carmen, I really appreciated your honesty. You sound like a terrific lady and I wish you well in your quest."

Men were always thanking me for my candor. There must be a whole lot of dishonest bitchy babes calling in. The bar concept was cute, but I liked the permanence of having the same voicemail box. That way if my true phonemate was out there, he'd know where to find me.

I finally wrapped the documentary and considered getting off the system, but it was Friday night and I had no dazzling plans for the weekend. Five minutes on the line could change that. André, a doctor with seductive enthusiasm and a penchant for rep cinema, rock, and laughter, caught my ear. I sent a message. He responded by requesting a live connection, then invited me to drive an hour beyond suburbia to drink Scotch and watch videos at his mother's house. He said I should bring my toothbrush. I declined, but not before idiotically giving him my phone number and suggesting we get together some other time. I hung up and made dinner plans with a friend from real life.

A few minutes later, André called, insisting we meet before he took off for a medical con-

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ference. I wouldn't cancel my plans, even though he decided to drive into the city. Two hours later I was standing outside my building, wearing a bulky black sweater, tights and knee-high boots with big silver zippers. I looked hot. A crumpled, stalky man whose eyeline met my breasts sauntered over. He craned his neck to make eye contact. He was grinning ear-to-ear.

"Wow," he enthused, "You're better than I expected!"

I wanted to disappear. Instead I stood over him, a heavy-metal Amazon in a daze.

"What do you think?" he quizzed me.

I think my judgment is seriously impaired.

"This is a bit weird," I shrugged.

He stepped closer, put his arms around my waist, and squeezed me.

"There," he smiled. "I just hugged you. You can't think it's weird now."

No, now I think it's unprecedented.

"André, you seem nice," I lied, "but I really have to get to dinner. Have a great time at your conference."

That was it. I finally expunged my ad from the system. But kept my voicemail box... just in case.

So, the other day I get home late, crawl under the covers, and hit the phone. It's 2 a.m. and there's a whole lot of whispering and sighing happening among the 60 insomniacs and degenerates on the line. In my temporary greeting, I cave in and ask for sardonic commentary on why everyone is talking in sultry tones. That's how Stephen and I cross lines. Shockingly his challenge isn't sexual, but intellectual. His lucidity and insight, despite his confessed drunkenness, are astounding.

"It's a Catch-22. Everybody is throwing around so many 'I'm intelligent' lines, they become debased, and if you say something intelligent you impress people to levels you can't possibly live up to. The beauty of this is the anonymity. Tell me where you are, how old you are, anything. What impresses me is someone extremely brainy who would rather talk about TV or beer or something rather than Rimbaud, or Rimbald, as that girl on 90210 so spectacularly mutilated." Swapping smart words about stupid television; I had found my phonemate. "Stephen, you don't know how refreshing it is to speak to someone who actually says something, rather than proclaiming how wonderful they are."

I am so excited to be having such a lively discussion and eagerly await his next transmission. "I too am derisive of the general tenor of the chat on the line. So, Carmen, the question is, What the hell are we doing on here?"

I confess to having gone on dates, but beg him not to ask for details. He is aghast.

"You had a date! I cannot imagine having a date with anyone on the line, not that there's anything wrong with that.... I can't imagine sitting with someone and having them look in your eyes and say, This guy's a geek! I can't risk that. But then again, if you're not seeking to meet people, you're seeking to have phone sex, which is fine, but not as socially redeemable. I just couldn't do it, 'cause I'm too much of a weenie. I didn't think you'd have a good conversation on the line; I guessed you could just whack off, and since I didn't have any offers in that area, this seemed like the place to be. I have to grow up a bit before I can actually meet somebody."

"Carmen, I'm getting off the line, as opposed to getting off on the line. Goodnight."

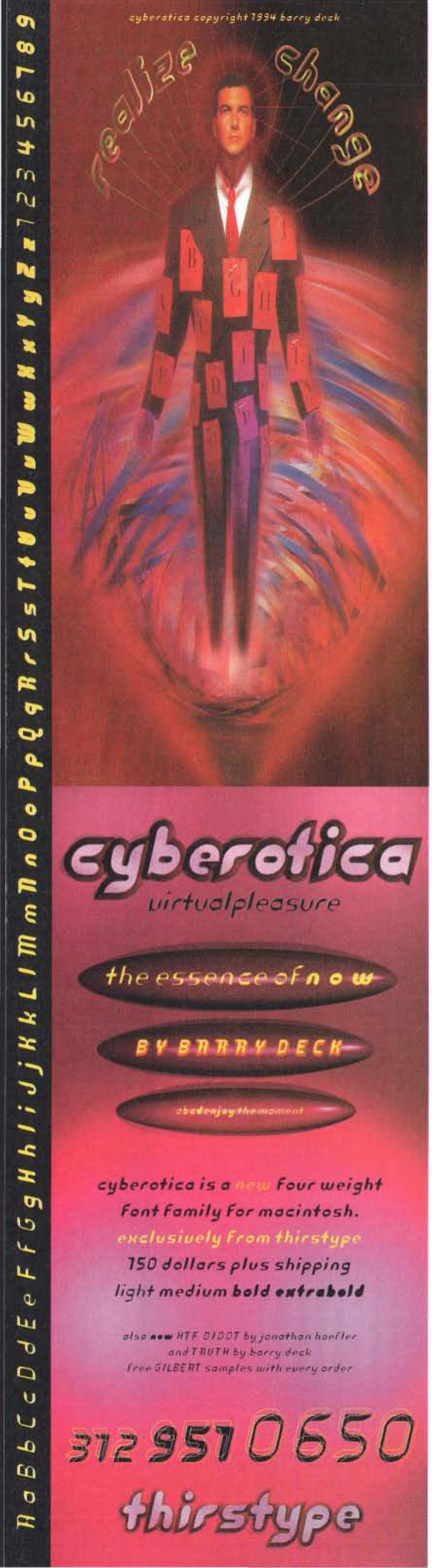
It was getting beyond late so we bid our farewells. He closed by sending the message, "Carmen, I'm getting off the line, as opposed to getting off on the line. Goodnight." My head was about to explode.

What is happening here? I have deleted my ad to discourage new loons. I've finally managed my habit to a brisk 34-second call each night to check messages, with only the occasional BoxTalk binge. I am sooo close to weaning myself of the line. I am edging toward hanging up for good. Then, Stephen's unexpected appearance and spunk thwarts all that.

In the days that follow, I can't manage without my phone fix, and we swap messages. I even feel confident enough to give Stephen my home phone number. Then he turns reticent. I feel cheated.

It has to mean something. Is it my clue to get off the system and back into the real world? Here is someone who hangs out at the same places as I do, listens to the same music, spews the same highfalutin pop pap. But Stephen doesn't want to be a real person; all he wants is to be a voice on the phone. And all I want is to reach out and touch someone. ■ ■ ■

Jennifer Cowan makes television and a lot of phone calls in Toronto. Her family was the first on the block to have two lines proudly linked by 10 telephones.



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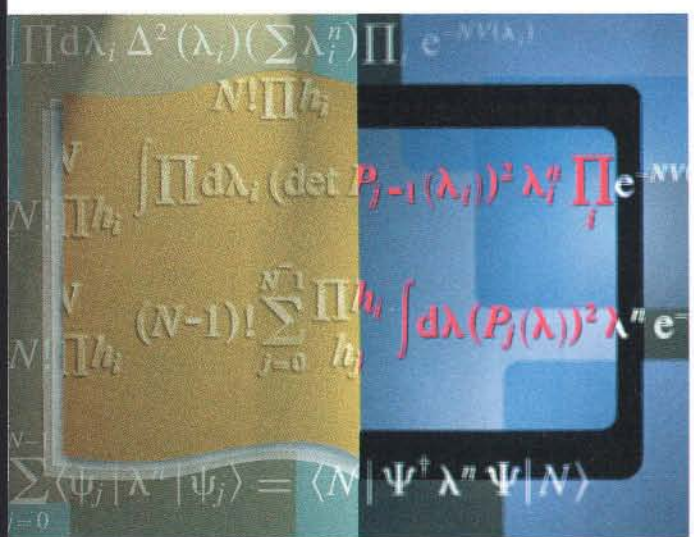
Goodbye, Gutenberg

Pixelating peer review is revolutionizing scholarly journals.

By Jacques Leslie

For a classics professor, James J. O'Donnell has a disarmingly contemporary way of summarizing how, four years ago, he considered using telecommunications to distribute a new scholarly journal on classical literature. "I compare that moment to Judy Garland and Mickey Rooney saying toward the end of the movie, 'Let's put on a show.' I'm the one who got to say, 'Gosh, we can do it in the barn!' "

Indeed O'Donnell – a professor at the University of Pennsylvania – is no ordinary classics scholar, and the journal he co-edits, the *Bryn Mawr Classical Review*, is no ordinary academic journal. Like the other pioneering scholars who are using "the barn"– the Internet – to disseminate learned journals, he is sufficiently comfortable with the unconventional, the interdisciplinary, and the new to challenge such resisters as computer-illiterate tenure-committee members and publishers preoccupied with profit margins, while quite possibly revivifying the 300-year-old institution of the scholarly journal.



Most members of university tenure committees belong to the last generation of scholars not steeped in the computer culture.That's about to change.

The *Bryn Mawr Classical Review* is one of about 450 electronic journals and newsletters that have come to life in the last few years, with many more in the planning stages. Of the 450, at least 70 are scholarly journals that accept articles only after they have been endorsed by experts in the appropriate discipline. In following this peer-review process, such electronic journals hope to attain the same legitimacy granted to their print cousins. Together, the electronic journals comprise what Ann Okerson, who follows the burgeoning field for the Association of Research Libraries, calls "the greatest time of experimentation in publishing since the 1500s."

"People have stopped saying, 'I don't know if the shift to electronic publication will really happen,' " Okerson says. "What they are now saying is, 'This is really happening, and how will it change the way we work?' " And the journal industry is surprisingly substantial. American universities and research institutions subscribe to somewhere between 30,000 and 45,000 academic journals, and sales in the US amount to between US$1.5 billion and $2 billion a year. Journals are the lifeblood of scientific, technical, and medical fields, in which they constitute the single most important means of conveying vital research findings. At the same time, the emergence of electronic publishing has evoked so much fear among print publishers that two years ago a representative of Oxford University Press, which publishes 154 scholarly print journals and a single electronic one, declared at a symposium: "I feel like a deer caught in the headlights of an onrushing truck." By now, some of that fear has been replaced by excitement over the possibilities that electronic publishing opens up, but the industry remains thoroughly unsettled. As Okerson says, "All the categories are shifting around as in a kaleidoscope."

Many journals appear in two separate formats, print and electronic (including both online and CD-ROM formats), and some are hybrids, combining features of both formats in one publication. Some online journals have tapped telecommunications' singular features to promote scholarly interaction and collaboration: perhaps the best example is *Psycoloquy*, a peer-reviewed psychology journal that features what Editor Stevan Harnad calls "scholarly skywriting": its scholars provide feedback on colleagues' work in formative stages.

Other journals exploit the visual potential of computers. *Protein Science*, for example, publishes its text in print, with images of proteins on accompanying disks; when the images are displayed on a computer screen, they can be "rotated" to create the illusion of three dimensions, enabling scientists to envision proteins with far more ease than is possible with print images.

Jean-Claude Guedon, editor of *Surfaces*, a bilingual scholarly electronic journal on comparative literature and a specialist in the history of science at the University of Montreal, says that the many designs of electronic journals remind him of the early days of the bicycle, when it appeared in "a bewildering variety of shapes." Just as the bicycle form eventually stabilized, Guedon expects that electronic journal design will, too, though the process may take five or ten more years. In the meantime, he says, the journals that flourish will almost certainly be those designed with enough flexibility to evolve.

Indeed, when electronic journals fail, one frequent reason is that they require readers to possess a particular kind of software or are accessible only to, say, Windows-based computers. The *Bryn Mawr Classical Review* appears in both print and electronic formats, but it's the electronic version that has taken off. Circulation for it and a sister electronic publication, the *Bryn Mawr Medieval Review*, stands at 1,750 and rising, while circulation for

LISA SEAMAN

the print version has settled at around 300. Not all articles that appear in the electronic version make the printed one, as O'Donnell luxuriates in the freedom from space constraints that prevails in the electronic medium. He also takes advantage of the speed of the electronic format to publish articles as separate units, as soon as they are approved and edited, sometimes months before they appear in the printed version.

Practices like this seem to call into question the very raison d'être of the journal, since the electronic format obviates the need for articles to be bound together in the familiar journal form. O'Donnell himself believes that as electronic journals become well established, "the journal model will evolve to-ward not a publishing operation but a gatekeeping operation"– that is, the journal's role will be to single out from the morass of information available on the Net those articles worthy of its imprimatur. "The journal can be a vehicle for reassuring deans, provosts, promotion and tenure committees, and other gatekeepers in the system that we've succeeded in the electronic environment in installing quality controls of the kind we've been used to having in the print environment," O'Donnell says.

Given the decreasing cost of hard-disk storage, it is likely that mathematicians a decade from now could house the entire body of mathematical literature in their desktop computers.

One reason electronic journals have evoked so much enthusiasm is that the limitations of print journals have become woefully obvious. For one thing, many are so expensive, with subscriptions ranging up to $10,000 a year and higher, that libraries have had to cut back, thus isolating scholars from information they deem important. A study conducted by the Association of Reference Libraries found that over the last two decades science-journal subscription fees increased at an average annual rate of 13.5 percent, far above the inflation rate. The high cost of journals has led scholars in many disciplines to conduct surveys to determine whether publishers are price-gouging. One prominent physicist at the University of Wisconsin at Madison published a survey in *Physics Today* comparing the cost and citation frequency of physics journals; he and *Physics Today*'s publisher were then sued in four countries by Gordon & Breach, the lowest-rated publisher in the article.

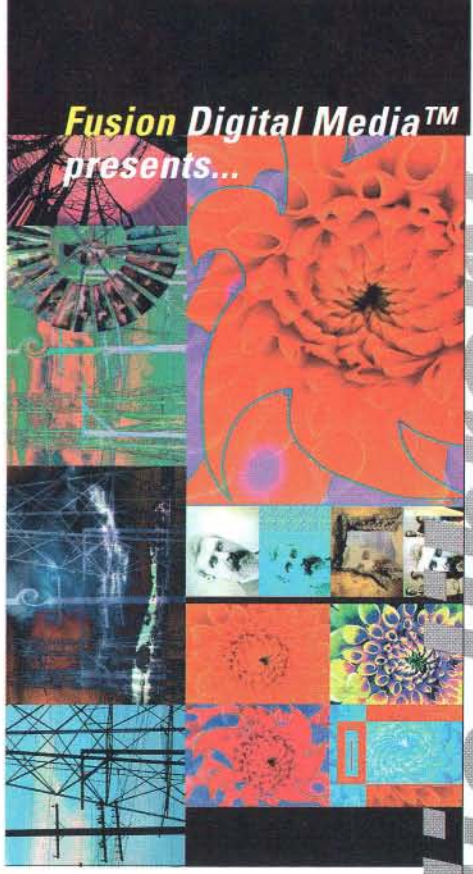
Even if print journals were less expensive, the sheer volume of scholarly output has surpassed the shelf capacities of libraries. Andrew Odlyzko, an AT&T Bell Laboratories mathematician, has estimated that in his field half of all the papers ever published appeared in print in the last decade, and that another doubling is likely to occur within 20 years. While this growth rate threatens to exceed the capacity of even the most expansive library, Odlyzko argues that given the decreasing cost of hard-disk storage, it is likely that mathematicians a decade from now could house the entire body of mathematical literature in their desktop computers.

Finally, in some fields the increasingly common use of "preprints"– copies of articles that are distributed to colleagues at the same time they are submitted to journals – has already lessened the utility of print journals. The gap between preprint distribution and journal publication ranges from several months to several years, depending on the discipline, so that in many fields preprints alone have "news" value, while a journal's role is reduced to culling, editing, and archiving.

The preprint system, however, is far from ideal. For one thing, it is expensive, with some institutions paying as much as $20,000 a year to copy and mail preprints; for another, it is undemocratic, since only those scientists "in the loop" of mailing lists receive the preprints, while less well-connected scientists and graduate students are usually left out.

It was not an electronic journal but a mere computer bulletin board that most dramatically demonstrated the potential of telecommunications in addressing all these issues. Paul Ginsparg, a high-energy theoretical physicist at Los Alamos National Laboratory in New Mexico, was frustrated both by the inequities of the preprint system and by journal publishers' disinterest in electronic media. In August 1991, after spending a few afternoons designing software, he launched an automated electronic archive using, in part, the ample data storage facility at Los Alamos. Physicists could post their preprints on the archive, read abstracts of other preprints, and, if the abstracts seemed interesting, download the complete articles into their own computers.

To Ginsparg's surprise, the system quickly became the primary means of communicat-



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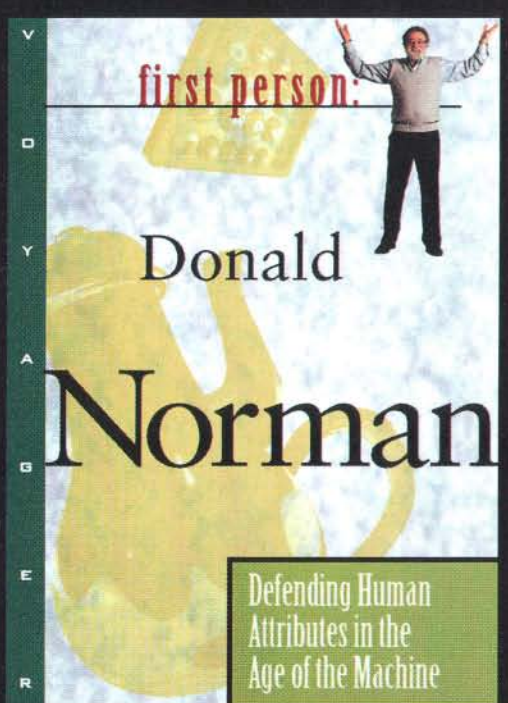
ing research data within his field. He eventually expanded the system to include more physics disciplines and other fields such as linguistics. According to Ginsparg, the system is now one of the largest and most active databases on the Internet, serving more than 20,000 users from at least 60 countries and processing the stunning sum of 30,000 or more messages a day.

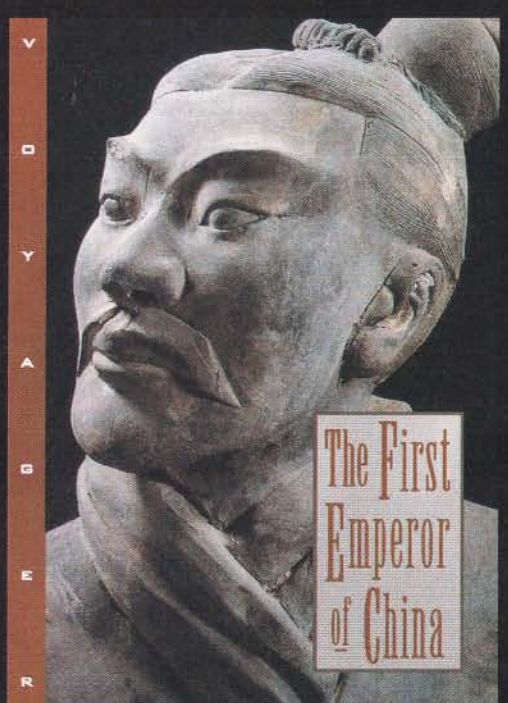
In a stroke, Ginsparg seemed to have eliminated the problems of print journals and preprints. Instead of paying thousands of dollars to distribute preprints, scientists could post them at virtually no cost. Whereas those scientists not on preprint mailing lists once had to wait many months to see the printed versions in expensive journals, they now enjoy the same instantaneous and virtually cost-free access of their most prestigious colleagues. The shortage of library shelf space ceased to be a problem; the only limiting factor became the size of the Los Alamos data storage facility, and in the unlikely event that it was ever filled, other facilities could be tapped.

To be sure, the high-energy physics community may be uniquely situated to take advantage of a system like Ginsparg's. Probably more than any other discipline, high-energy physics relies on preprints, so its members can easily make the transition from photocopied to electronic preprints. And unlike many other scholars, particularly those in the humanities, virtually all physicists are experienced in computer telecommunications. Also, the field of high-energy physics is sufficiently small so that scientists' reputations are well known, and projects are often carried out by large research teams that vet articles before they reach the preprint stage. Both these factors mitigate the value of peer review, a feature of printed physics journals but not of Ginsparg's system.

The Los Alamos system, however, gives a misleadingly rosy impression of the benefits of electronic publication. Consider cost: if the Los Alamos system included editing and peer review, something most scholars value, its costs would rise. If it included such features as hypertext links, an attractive refinement of the electronic medium, the costs would rise further. And if the cost of using the Internet – which may increase substantially as privatization proceeds – is also factored in, then its costs would rise still more. As it is, the system is essentially cost-free only because neither Los Alamos National Laboratory nor Ginsparg have been paid for their contributions of data-storage capacity and labor.

The system also fails to address copyrights, one of the most nettlesome problems in electronic publication. Print journal publishers currently attribute declining subscriptions to the high cost of journals; if, however, they believed that electronic journals such as the Los Alamos archive accelerated this decline, they might consider asserting their copyrights. (Publishers of print journals carrying articles that also appear on the Los Alamos system could insist that the articles be removed once print publication occurs.) They have not done so, if only because they believe the Los Alamos system so far has not cut into their subscription revenues, and because they feel some obligation not to hobble an institution that clearly benefits their scholar clients. The fact remains that electronic publication will make copyright enforcement much more difficult. How will a publisher who charges for access





to an electronic journal cope with the ease of duplicating and distributing journal articles in the electronic medium? Some publishers say that if they find that widespread abuses occur, the cost of subscription to the journals will have to be higher as a result. (Currently, few electronic journals charge for subscriptions; however, many of those that are now free plan to charge in the future.)

Nevertheless, it is likely that electronic publication represents the future of academic journals. Odlyzko, author of a paper called "Tragic Loss or Good Riddance? The Impending Demise of Traditional Scholarly Journals," predicts that the vast majority of print journals will disappear or be transformed into electronic journals in the next 10 to 20 years. Some electronic journals have already experimented with developing parallel bulletin board discussion groups, and some electronic journal editors foresee the creation of linked MUD-like "virtual corridors" in which colleagues trade ideas. Ginsparg envisions an alternative to "all-or-nothing" peer review; instead, he says, journals could embody the evolving nature of research by dividing articles into several categories, or, better yet, by placing them within a "fluid medium" in which discussion and affixing of addenda and errata are encouraged.

All these notions, of course, embody the activities that cyberspace seems inherently to promote: the materiality of printed journals and the impermeable individuality of their authors gives way to the interaction, collaboration, and community that the electronic medium fosters. If the change is only in its beginning stages now, one reason is that most of the current members of university tenure committees belong to the last generation of scholars not steeped in the computer culture, and have so far declined to acknowledge publication in electronic journals as a credential for promotion. Poised to make the leap but uncertain of its benefits, they may not understand the trade-off. What they're being asked to give up, after all, is the illusion of permanence. ■ ■ ■

How to Find the Scholars

Bryn Mawr Classical Review: Archive site: The gopher URL is *gopher://orion.lib.virginia.edu:70/11/alpha.bmcr*;

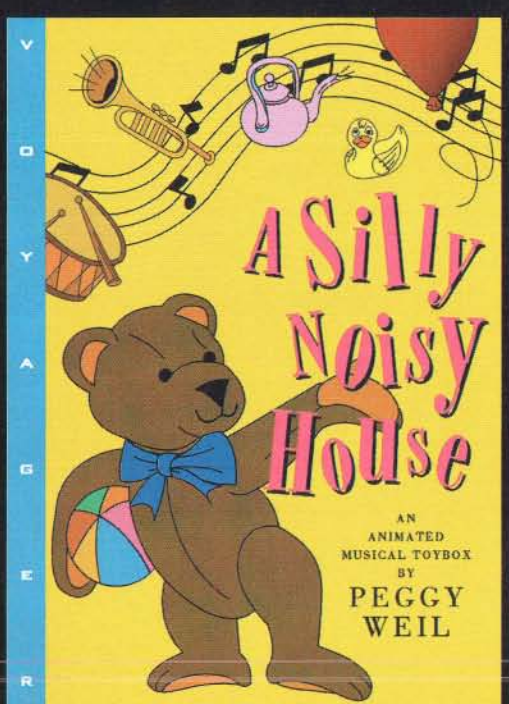
Psycoloquy: Anonymous ftp to *princeton.edu* and check the directory pub/harnad/Psycoloquy;

Surfaces: Anonymous ftp or gopher to *umontreal.ca* and look in literature/revues;

Los Alamos National Laboratory, Physics Service: Gopher to *mentor.lanl.gov or point your www client to http://xxx.lanl.gov*;

Directory of Electronic Journals, Newsletters, and Academic Discussion Lists: Send e-mail to *ann@cni.org* at the Association of Research Libraries, +1 (202) 296-2296, fax +1 (202) 872 0884.

Jacques Leslie (jacques@well.sf.ca.us) *writes frequently on the social aspects of computer telecommunications. His memoir of the Vietnam War,* The Mark, *will be published in 1995.*



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Read Hundt

Wired asks the chair of the FCC about cutting cable rates and competition, censoring Howard Stern, and John Malone's suggestion that he be taken out and shot.

By John Heilemann

The chair of the Federal Communications Commission is more than just another box-suited bureaucrat. To those inside Washington, he's an A-list player, the guy in charge of the Pentagon of the digital age; to media mogulmaniacs and telecom titans, he's the politician who matters. Although Congress must pass legislation to set new outlines for competition on the information superhighway, the FCC is the one to implement and enforce those laws where the rubber meets the road – or rather, where the bits meet the bahn. To be FCC chairman is to be a lightning rod for controversy.

The time has come for the cable industry to be willing to face competition. It no longer needs protection against competitors.

Even so, Bill Clinton's choice for the job, Reed Hundt, has proven especially electrifying. Early this year, in his first big move at the FCC, Hundt pushed through an order to cut cable television prices by 7 percent. Cable bosses went ballistic. Bell Atlantic and Tele-Communications Inc. blamed the rate rollback for the breakup of their multibillion-dollar marriage; Time Warner's boss, Gerry Levin, accused the FCC of "Soviet-style" regulation. Not since John F. Kennedy's man at the commission, Newton Minow, called television a "vast wasteland" has an FCC chairman managed to piss off more people in an industry he was responsible for regulating.

Cable barons have been so hostile to Hundt partly because they view the "7 percent solution" as a sign that he has a grudge against them; or, just as bad, that he is clueless about the economics of the industry. They widely believe that Hundt, sworn in November 29, 1993, was appointed less for his qualifications than for his political connections. All of which is more than a bit true. A 46-year-old antitrust lawyer, Hundt had no background in communications issues. He was a classmate of Clinton's at Yale Law School and, more crucially, has been a close chum of Al Gore's since prep school. Hundt made charges of cronyism all the more credible by bragging he was the only man alive to give money both to Gore's first congressional campaign in Tennessee and to Clinton's first run for governor in Arkansas.

But some of the attacks on Hundt have been unfair. In passing the Cable Act of 1992, Congress intended, rightly or wrongly, to see cable prices fall. The FCC's job was to make that happen. Consumer groups (and others whose interests extend beyond their own profit-and-loss statements) give him kudos. Although Hundt is no techno-savant, he is plainly intelligent, subtle, and savvy about economics – all qualities essential to dealing with the fiendishly complex public-policy issues that litter the emerging digital landscape. *Wired*'s John Heilemann met with Hundt in his office in Washington early last summer to hash out some of these issues.

Wired: The first time you and I spoke was after I had written an article reporting that you're the most reviled chairman the FCC has had in years. Then came an interview in *Wired* ("Infobahn Warrior," issue 2.07, page 86) in which John Malone, the boss of Tele-Communications Inc. and a leader in one of the main industries you regulate, suggested you should be taken out and shot. Why are you so unpopular?

Hundt: [Grimaces.] I think you probably need to talk to a larger group of people if you want to assess my popularity with industry. But that's a good why-did-you-stop-beating-your-wife type of question.

I've spent a lot of time with people in the cable industry; I've met with the key bankers to the industry; and my own impression is that the relationships are cordial and productive. There have been a lot of people in the industry who have been complimenting the FCC over our good faith and our sincerity in trying to achieve two objectives. The first is the law that when a cable provider is the only seller in town, it cannot charge an unreasonably high price for basic services. At the same time, another objective is to permit cable operators to add channels and services to increase capacity. These are two objectives that are reconcilable, but they require care and attention on the part of the industry and the FCC, and we've been working together very, very closely.

There's another comment Malone makes that I think is substantive and not merely personal. He says that in ordering the 7 percent solution, you were sort of a dupe to Rep. Ed Markey [D-Massachusetts] – a naïve regulator trying to get in good with a key congres-

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Our policy is that competition should drive all markets. I don't believe government should build the information highway, and I don't believe a monopolist should be given the exclusive license to build the information highway.

sional figure. Is that a fair assessment?
Number one, our decision was based on the Cable Act of 1992. We read the law. We looked at the economics. And then we did what we felt was the right thing. We were not the tool or pawn or dupe of anybody. The statistics overwhelmingly demonstrate that where there is competition for a cable programmer's offerings, the prices are lower. In only about 1 percent of all the markets in the country is there competition today. But it should come as no surprise to any consumer that where there is competition, prices are lower.

Now, at the same time, basic and enhanced basic service are supposed to be evolving products. They're not supposed to be fixed in time forever. We want to make sure that we work with the cable industry to determine how they can evolve. The very instant there is "effective competition," there is no need for rate regulation.

But the cable industry has in some ways been as immune to competition as the telephone industry, hasn't it?
In many ways the cable industry's ability to compete with broadcasters has been furthered by the FCC. For decades we have been working to expand opportunities for the cable industry to offer competitive alternatives to broadcasting offerings. More than 10 years ago we made sure with the pole attachment law that the cable industry could connect their cables to households. In 1984, Congress not only substantially deregulated the cable industry, but also passed a law barring telephone companies from offering video programming that would compete with the cable industry. Now the time has come for the cable industry to be willing to face competition. It no longer needs protection against competitors. It is now a strong, viable, competitive force. In fact, it is so strong and so viable, it doesn't even face competition for basic and enhanced-basic in 99 percent of all the markets. So it's time for new entrants to come in and offer choice to consumers.

That process of increasing competition, that's the touchstone for you in terms of how you think the information superhighway should be built.
Our policy at the commission, and my personal policy, is that competition should drive all markets, especially the building-out of the info-highway. I don't believe government should build the information highway, and I don't believe a monopolist should be given the exclusive license to build the information highway. But there are three principles to this competition: choice, opportunity, and fairness. *Choice* means businesses that want to use the information highway should be able to choose their method of transportation.

So that's open access?
Yes. That's similar to the concept of open access. It also means the consumers who want to use the information highway to communicate or to buy products and services should have multiple offerers. *Opportunity* means all businesses and all service providers should be able to use the information highway to sell their wares. I consider that to be a little closer to the open access theme. That is also why you hear about questions of compatibility and interconnection. And then *fairness* is consistent with the way America thinks about competition in *all* industries. If you have an incumbent monopolist, you don't let that monopolist act unfairly to deny competitors entry. But another aspect of fairness is that if you have an incumbent monopolist, you don't want that monopolist to be able to charge consumers unreasonably high prices when they don't have any choice – when it's just take it or leave it from the same seller. It's that aspect of fairness that is behind the Cable Act of 1992.

Congress is currently haggling over a number of different bills to deregulate the communications industry, to let the TV and telephone industries invade each other's traditional markets. Are we heading in the right direction on Capitol Hill?
On the hill, Reps. Ed Markey, Jack Fields [R-Texas], Jack Brooks [D-Texas], and John Dingell [D-Michigan] and Sen. Fritz Hollings [D-South Carolina] and others are in concert on introducing competition in all communications markets. That's the FCC's policy. That's the White House's policy. And that's a very difficult policy to implement, because the incumbent firms don't easily allow new competitors in their markets. So, it's a fight to introduce competition, but that's a fight I eagerly take on.

Which barriers between industries should we remove, and when? In Britain, the government of former Prime Minister Margaret Thatcher deregulated most aspects of the telephone and cable industries in one fell swoop. As a result, investment in the British version of the info highway has taken place at an incredible pace. Is the Thatcherite vision of deregulation too radical for America?
No. These debates about sequencing are like a dance contest between two partners when neither one wants to let the other take the lead. They're all trying to figure out where the advantage lies. Incumbents are anxious about the prospect of competition and the new entrants are eager to enter. There is the potential for gridlock: when all incumbents finally agree, Gee, maybe it's too much trouble to take the risks of competition. It's very important to break down that gridlock.

In this interview with Malone that you mentioned earlier, he talks about how he thinks cable is the most aggressive competitor in building the information highway. He seems to imply that we're more likely to get competition in communications markets if telephone companies don't merge with cable companies.... I thought that was an interesting interview, because it was only last fall that many people were saying telephone and cable mergers were essential to building the information highway.

It was Malone who launched the biggest such merger himself.
And many people think that if the government did anything to stop telephone companies from merging with cable companies, it would be inconsistent with wanting to build

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the information highway. Now I'm reading in this interview with Malone that maybe the most appropriate kind of actions would be anything that allows cable to go after telephone companies and vice versa, as opposed to merging. Well, what I'm saying here is that the business strategy of the season may change, but the policy of competition should never change.

TCI and Bell Atlantic both cited the cable rate rollback as a reason for not merging, because it would destabilize their cash flow. The multibillion-dollar telephone/cable marriage between Southwestern Bell and Cox Cable also fell apart, and the people involved in that deal blamed the FCC. The comment you just made suggests that policy issues were not as important in those decisions as were more fundamental questions of business strategy.

There's no question that our decisions are important to the businesses.... Let me address specifically the failure of Bell Atlantic and TCI to merge. I read a detailed explanation of this in *Wired*, in which Malone cited the drop of Bell Atlantic's stock price and the difficulty of merging a dividend company with a growth company.

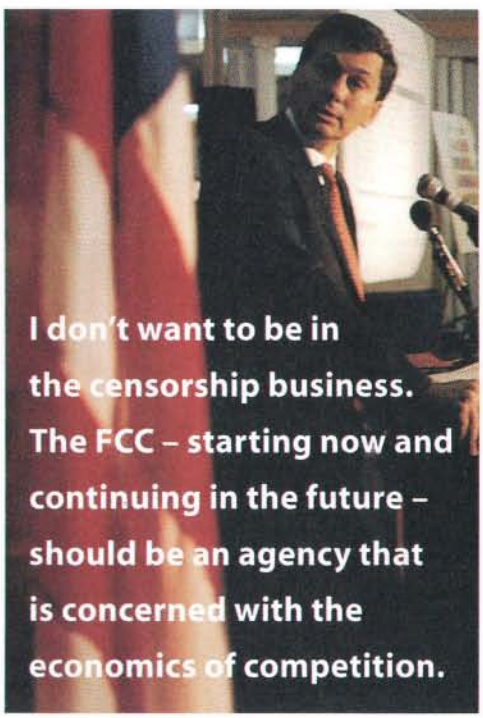
Do you think a policy of competition is one that's likely to end up providing universal service? And what exactly does "universal service" mean in the context of the information superhighway?

Let me give an example. In our personal communications services auction of broadband spectrum, which will begin toward the end of this year, we're going to be jump-starting competition from the get-go in the next generation of mobile telephony. It's the first time any country in the world has ever committed to a policy of competition in communications markets from day one. This is in contrast to the commission's creation of the duopoly in cellular telephony more than 10 years ago. We're not committing to a duopoly here. We're committing to a multiplayer market in which there will be vigorous, robust, and accelerated competition. It will lead to lower prices, higher quality of service, and greater penetration to a greater number of Americans than another policy would get you.

A chicken in every pot and a car in every garage.

No! Exactly not that. Just the greatest amount of penetration that private entrepreneurship is likely to get. It is difficult for one provider, or a comfortable duopoly, to engage in the kind of price wars that would increase penetration to the maximum number. They have many incentives to cooperate, and a monopolist has many reasons not to offer its product to all people at affordable levels, because there comes a point on the price curve where a monopolist makes more money by constraining output. This is pretty fundamental economics. We want to see competition drive prices down to get the greatest amount of penetration through the workings of the marketplace.

What I can't tell you is what the percentage of the country will be that is reached by that competition. I can only tell you it will



be a much greater percentage than would be reached if we *didn't* have a competitive policy.

So, we have to wait for the out-years to get the facts. That's point one about my policy on universal service. Here's point two: notwithstanding all of the above, I think it is absolutely essential that the information highway be connected to every classroom and every clinic and every library in the country as *soon* as practical.

Being on the information highway is the only way to participate fully in our economy. It is going to be essential for virtually all Americans. I want us to have a policy of connecting all classrooms for the beginning of any installation of broadband interactive services.

Well, these are the standard arguments people make for universal service. Namely, it's pretty much impossible to live a

STEVE FUJIKAWA

productive life in modern society without having a telephone.

There are other reasons. You have to be part of the communications network to participate fully in the economy. If I give you a chance to participate in the economy, I'm probably increasing the size of the economy. So you can make an economic argument in favor of that. But also, I want you to participate in the communications system in the country for purely social reasons. I'd like you to be able to cast your vote in an informed way. I'd like you to be able to express your opinions, under the First Amendment, and to share in the development of community. Third, I have health and safety reasons for wanting you to participate in the communications system. I'd like you to be able to call for help. I'd like you to be able to get a diagnosis from an expert doctor in a remote location.

Do you think that being connected to the information superhighway will be equally essential? That, at some point, upholding the political, economic, and social values you just mentioned will require the government to step in and ensure universal service from a "fat pipe," a broadband connection?

The information superhighway *right now* consists of our universal broadcast system, our almost-universal telephone system, our almost-universal cable system, our universal satellite system, and our virtually universal wireless system. Right now, all five of these parallel and almost-universal networks deliver voice, video, and data – to varying degrees. As they become digitized, they will deliver even more. And almost all of them will become interactive. I don't believe there's going to come a day when some other system will replace all five. I believe that all five will intersect, interconnect, overlap. And we will end up with a network of these networks.

When I talk about connecting all the classrooms in the schools to the information highway, I would like phone lines in those classrooms as soon as possible – the day after tomorrow. But I *also* agree that as the fatter pipe or thicker connection that facilitates broadband interactivity is deployed everywhere in the US, it should be deployed in the classrooms as part of the first stage, not the last stage.

For kids in the classrooms, the real connection to broadband interactive services is, I believe, going to be related to the greatest revolution in the history of education since the development of the printing press.

At the same time you will be addressing head-on the question of remote locations, small town USA, and rural versus urban, and all the other tensions that are usually in people's minds when they focus on the problem of universal service. If you make the commitment to connect the advanced network to all classrooms, clinics, and libraries, you will ensure that all geographical parts of this country are connected.

Given that so much of the justification for regulation of communications has always been based on the idea of scarcity of spectrum, for example, what do you think the FCC's role should be in regulating content in a world of abundant bandwidth?

I don't want to be in the censorship business. The FCC – starting now and continuing in the future – should be an agency that is concerned with the economics of competition. But we don't have this abundant bandwidth yet. It is promised to us by the technological mavens, and to some degree by the financiers. But we aren't going to get it if we don't have competition.

So how does that sit with the FCC's actions relating to Howard Stern?

You mean what's his reaction to what I'm saying?

There are critics who would claim the Stern controversy shows the FCC is very much in the business of being involved in free-speech issues.

We have never censored anyone. We've never told anyone that it is illegal or unconstitutional for them to express their views. The only question in the broadcast context is whether, given the free use of the spectrum that has been granted to broadcasters, broadcasters should be required to channel certain kinds of programs in late-night hours when children aren't listening.

That's the only issue. I don't see that as a censorship issue. That is an issue of living up to the social compact between the people and broadcasters. The deal is that they get the free spectrum and they need to do certain things for society in return.

Have you ever listened to Howard Stern?

No.

Why not?

I don't even know what channel he's on.

■ ■ ■

John Heilemann is Washington correspondent for The Economist. *He wrote "Can the BBC Be Saved?" for* Wired *2.03.*

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Night-Trapped

Rob Fulop is responsible for the first videogame to be denounced by the US Congress – and Captain Kangaroo.

By Ron Martinez

PF Magic Creative Director Rob Fulop found himself in the spotlight last year when *Night Trap*, an interactive movie game he developed for Hasbro five years ago, found its way onto Sega's CD-ROM platform. A B-movie spoof with a loose plot featuring scantily clad coeds victimized by evil vampires, *Night Trap* became *the* symbol of all that was wrong with videogames. Toys "R" Us pulled it from the shelves, and Captain Kangaroo denounced it on network TV. Fulop discusses the lessons he learned and the future of interactive gaming with Ron Martinez, vice president for creative development at Spectrum HoloByte Inc.

The people deriding this game needed a game in the public eye that said, Hey, the stuff your kids are playing may be dangerous.

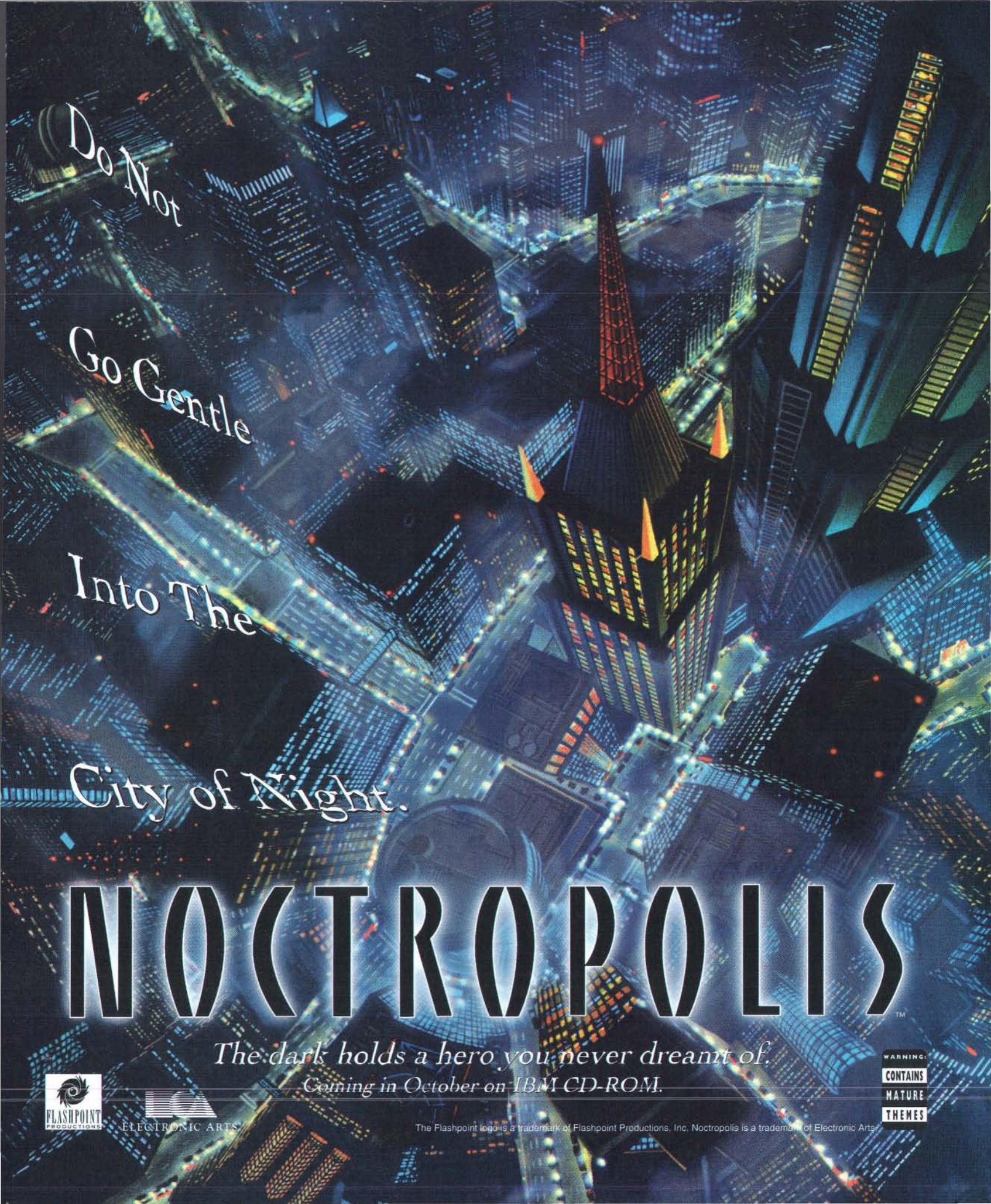
Martinez: So, Rob, what happened with Captain Kangaroo?
Fulop: Captain Kangaroo went on TV and said my game *Night Trap* was caca. As did a lot of my friends. And that was not good, it was not a good day.
How did *Night Trap* come about?
Jim Riley and I were doing interactive videotape projects for Hasbro. In 1988, Hasbro wanted to get into the game business with interactive movies on tape, "branching movies." So we went to see the interactive play *Tamara* and thought, This is great, this is a good model for interactive tape, because the story keeps going and you keep moving around. It's a linear story, but with changes in point of view, so it seemed ideal for interactive tape, which had no random action. You couldn't jump back to the beginning; you had to keep going.

So we did a short demo, a whodunit called *Scene of the Crime*. It was cool, and they said, "This is great, let's do a long piece, do it for kids." So we did the same idea, but we made it into a vampire story about vampires and augs. The show is set at a winery run by a family of high-tech vampires who bottle blood. But they are constantly being robbed by the pure vampires – augs – who have no access to high technology and have to revert to their old-fashioned blood-sucking ways.
The hands-on approach.
Right – the old-fashioned way. The game was originally going to be bundled with the Hasbro system. And Hasbro told us, "We don't care how much it costs, make something that's great, that everybody has to have."
But *Night Trap* always struck me as a comedy, which is the funny thing about its treatment in the media. Somebody told me that on the news they'd repeatedly seen a clip from the game where someone is attacked with a drill – replayed so often that it was like the Rodney King beating.
Yeah. What they never show is the scene right after that, which gives you the "Game Over." So it's not like it's a reward. It's not like the object of the game is to maneuver people into being drilled to death. Your job is to save them.
It seemed obvious to me that the intent of the game was not to promote violence. It's a kind of goofy spoof on B-movies and slasher movies.
It was a vampire movie, for fun. There must be scenes in a vampire movie where you establish the vampires as bad people. *The Phantom of the Opera* does that. You must show that they suck people's blood. Otherwise there's no vampire.
The thing that I began to wonder is, Why is the media playing it this way?
The people that were deriding this game had never played it, obviously. It was just clear they needed a game in the public eye that said, Hey, the stuff your kids are playing may be becoming quite dangerous to them. Because now the images are becoming more and more realistic, the games are becoming more cinematic. Therefore there's potential for games to go anywhere; there's no end to how drastic they can become. And I felt that the treatment of *Night Trap*, right or wrong, brought that into people's consciousness – that we need to take care. These aren't little cartoon games any more; this could be pretty horrific stuff. Still, it's getting banged around unfairly.

There needs to be a rating, just like there is in motion pictures. We need some sort of controls here. You can't let directors make a snuff film: you probably don't want to have a game where the object is to run around and shoot people. Even though kids would love to play it.
You said there shouldn't be a game where you run around and shoot people, but there are plenty of games where the only objective is to shoot people. I've played *RoboCop versus The Terminator* on Sega. Everybody you shoot vaporizes in a cloud of blood, and this gets zero attention! So, clearly the media is singling out some games for a public dunking.

I was playing a live-action videodisc game at the arcade on Pier 39 in San Francisco. It's made by American Laser Games. I forget what they call it, but it looks like *Cops*, the syndicated "reality" TV show. You play the role of a cop, and you actually shoot people. But what was really chilling was, I was watching a father

WILLIAM ZEMANEK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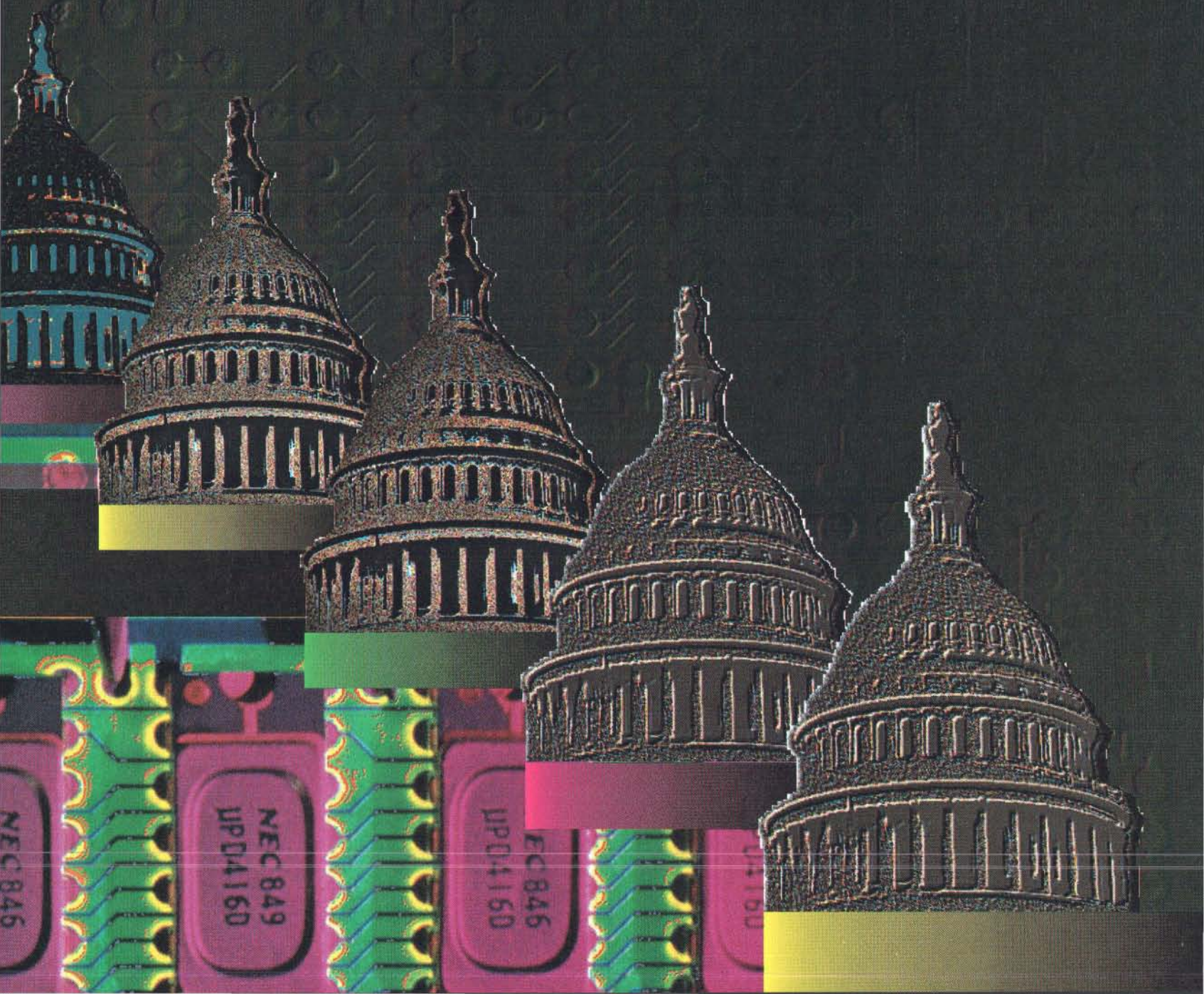


and son play it the other day, one Saturday, and the son takes the gun in his hand, heads into this warehouse, shoots a couple of bad guys, and then accidentally shoots another cop dead. And his father laughed, and the kid laughed. It was a twisted, touching moment where father and son had come closer together: they'd shared a humorous experience on a Saturday afternoon.

What I've now learned from the *Night Trap* thing – some five years after we made it, and after seeing actual kids play it – is that, if you give the kid the ability to either trap a monster or not, and thereby send the girl to her doom or not, it doesn't matter if the object is to save the girl or harm the girl. If you're playing the game, you're a conspirator by virtue of the fact that you have some control. Whereas, when I'm watching the movie *Friday the 13th*, I have no control. Even if I see the same horrific scene in *Friday the 13th*, it is not under the control of the user. You can play *Night Trap* and decide Hey, watch what happens, Kelly's going to get it. It's almost the same as saying, Watch what I'm going to do. So the lesson to me is that we do need to have a little bit more involvement. People do feel bad when they make a mistake.

Players are responsible for what happens?

Yes, they *are* responsible. So I think there is an obligation on the part of the people who design this stuff to think about that. I certainly think about that.

Do you think there's a fundamental difference between the games made today and those made in 1981, when you started on Atari games? You've got increased resolution, mass storage, more powerful processors. The fundamental experience, has that changed?

We're in the game business at PF Magic. Our approach with multimedia games is that we still make games, they just *look* better. The monsters look more real, but it's still a game. So, fundamentally there's no difference between *Hard Driving*, the driving game that Crystal Dynamics just put out for 3DO, and *Night Driver*, which was put out 12 years ago. Some games today play the same, they just look better. But there are also whole new products now that you couldn't do then, like *Night Trap*. You couldn't do *Night Trap* 12 years ago.

That's the thing I'm interested in. Are there new aesthetic agendas that you've got now?

The early games – *Pac Man*, *Space Invaders*, *Pong*, *Break Out* – those are pure games. They were designed to be replayed. They were drastically, incredibly primitive. But the point is, the human brain doesn't care. You play these games, and by the third time you play the graphics are invisible to your brain.

I think you're right. With film or television, it's about what you see and what you hear – and in our business it's about those too, but it's mostly about what you do.

In film it's about the story. If a story is great, you can tell it over and over again. *Romeo and Juliet* worked, *West Side Story* reworked it as a stage show and as a movie. You keep redoing it.

14-year-old boys are not at the point where they can start driving and dating, and they're basically looking for something in their lives that they can control.

There's a film grammar; there's a way to sequence graphics and tell a story. It's a hundred years old, and it hasn't changed that much. But there's also an interactive grammar. That's the nature of the gameplay. Whether it's an adventure game or flight simulator, action game or platform videogame, there's a category with its own kind of interactive grammar. The grammar of that activity really owes its form to the nature of the machine. You've got hardware that's capable of doing a certain thing, and if it's really good or interesting hardware, then you have a new kind of interactive grammar possible on that machine.

And since machines will continue to evolve and their capabilities will evolve, the grammar or the nature of the interactive experience that people buy will continue to change.

We're doing an interactive game called *Ballz*. It's a fun and irreverant fighting game. There is no story, so to speak. The story is the fight. And it follows the fighting vocabulary, which is, I pick a character, I expect to be in the control of that character at all times. That's my expectation. Players don't like it if you take away control of the character to tell a story. Their expectation is, It's my guy – I'm always fighting. You don't have to do anything other than play off that.

One of the things that attracts people to interactive entertainment is the degree to which it's an experience generated in real time, that they collaborate in the creation of it. As opposed to what I'd call "Coke machine" interactivity – you know, I hit Coke, out comes Coke.That's more selectivity than interactivity. If you're going to generate the emotional or situational behavior of characters, then you've got to generate it with chunks of a certain size. For us the chunk is the encounter between two characters.

A story is driven by desire. If characters want something or desire to do something, they try to go out and get it. We give players the means to put together different pieces of dialog and action pretty competently, to get into an encounter and try to get what they want. That chunk is what is generated. It's different from what you're talking about, from continuous control.

When I was doing *Night Trap* with Hasbro, we used to evaluate a script on number of interactions per minute. IPMs, they were called. And it was only after being part of the review process for a year that I realized that "interactions per minute" is meaningless. Does more interactivity mean it's better? I don't know. In the last year we came up with many ideas for interactive entertainment with one choice.

For instance: a real-time show where you follow people around the city, and when you click on somebody you think is interesting, you give that person a million dollars, and you follow that person for the next hour and watch what happens. That's an interesting interactive show. Give it to the garbage man, give it to a traffic cop, give it to some 12-year-old kid, you'll have different movies that'll be compelling as hell, with just one choice. Whereas if you have a street fight, it's continuous control. So there's a spectrum. It's not true that more interactivity is better. The thing that I just described is not a game. There's no object to it. It's interactive entertainment.

Well, you know, it's funny; it's like there are two audiences. There are people who have been playing games since games appeared. And there's this perception that there's a very large, untapped audience, "the rest of us."

I think there will be. I don't think it exists now.

Well, I don't think anybody's put anything in front of those people that would really attract them. You know, the question is, Is it great Nintendo or bad television? People now say, "Imagine. What you see on your screen, you can interact with. You can press a button and make something happen on the screen." From 8-bit computer games on, this is not news. This is old news.

It's old news if you're 15 years old. Not if you're 40 years old.

So, is that the audience multimedia is going after, 40-year-olds?

You didn't grow up with a videogame.

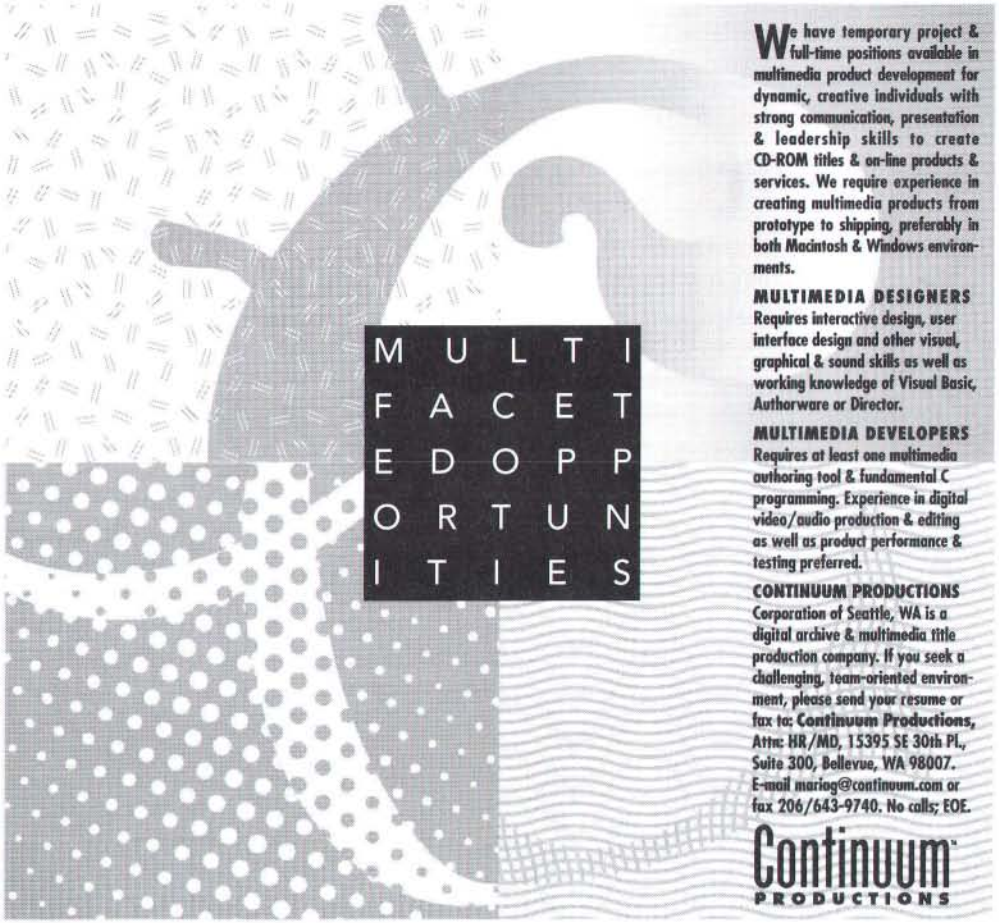
No.

You played your first videogame when you were in high school probably, or older. But I'm talking to kids now in focus groups who have played videogames since they were 2. They grew up with games the way you grew up with the telephone. And as they get older their tastes will get more and more sophisticated. Right now, they're into blowing shit up.

Do you know the phrase "ontogeny recapitulates phylogeny?" It means that the individual of the species revisits the development of the entire species in its own development. So we start off as single-cell animals, and then become tadpoles, then little mammals – and the same thing is happening in our medium. We're recapitulating the development of narrative, and our medium has just about gotten to *Beowulf*, which is all about exterior events. "We drank mead, we went out, we faced Grendel, we came back, we drank mead." The next stop would be to introduce interiority. "We drank mead, we went out, we faced Grendel, and I was scared. But I overcame my fear, and I put the sword in him, though my friend was killed.... I'm not sure it was worth it." That's a very different experience. And that's the next step for our medium.

I'm working on experiences where a computer brings human beings together. That could be a fighting game, where they confront each other. That may also be a soap opera, where they each watch something different and discuss it later. Or that may be a role-playing game.

The one thing that I've noticed about *Night Trap* was that, love it or hate it, it was as much fun to watch as it was to play. You could be sitting on the couch watching, or you could be driving. It was like TV. And I think that's really what it's going to take.



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That's an experience you can have in a group. Absolutely. And I think there'll be more of that.

The worst state I've been in while playing a game has got to be playing *Mortal Kombat*: I was just this little quivering mammal with a brain stem set on fight or flight, and I was *literally* in a cold sweat playing that game. High-order thinking was gone.

Was that good?

It's like masturbating or something. I felt reduced. As a human being, I was reduced to something less than I was before I played the game. Whereas if I played something like *Myst* – *Myst* is beautiful. It puts you in a meditative state. It works to stimulate high-order thinking. You begin to project; you become creative, in effect, because you project a lot that isn't there onto the scenario. You start imagining what all that stuff is and putting all the pieces together.

I guess my response to that is, I can watch an Arnold Schwarzenegger movie and get reduced to the yaah!-kill-'em state, or I can go watch *Remains of the Day* or *Schindler's List* or *The Jungle Book*, and I have completely different experiences. I think it doesn't have to be just one or the other.

No, it's not about one way. But that's just the point. You can go to the video store, and you can find the meditative on one end and the kick-ass on the other. But in our medium, you've got to really search for the meditative.

Because the market is 14-year-old boys.

But why is the market 14-year-old boys? That's the question.

Because 14-year-old boys are not at the point yet in their lives where they really understand this thing called 14-year-old girls, and they're not at the point where they can start driving and dating, and they're basically looking for something in their lives that they can control. If they hate the fact that their parents take them to soccer practice, and pick them up from this and that, games are the thing that they find they can completely master and control and own. And they can do this better than anyone in the fucking world.

And the problem is, as I see in more and more focus groups of kids, that the ability to make-believe is almost nonexistent today. When I was little, I'd go to a James Bond movie and then we'd make-believe James Bond for the next year, until we saw the next one. I didn't have *Goldfinger* on videotape. I didn't have my favorite movies available whenever I wanted. It was a big event to see a movie, and there was a year of "Let's play James Bond." Ask 12-year-olds now to make up a story. They don't know how.

They're inundated with stories.

Inundated. They never have to make them up. So they don't know how to make up a story. And I attribute that to VCRs and videogames. It may make it hard for new multiplayer role-playing games to exist. If kids are being slowly destroyed by the stuff we're giving them to do, then they're not going to be able to know how to play them.

After 12 years of making these games, I'm worried about what they might be doing to kids. That's why I want to make games that involve other human beings.

I remember once my nephews got this toy, Skeletor's Castle. There was this evil character, Skeletor, glued onto a plastic castle. There was a microphone; you talked into the microphone, and your voice was amplified and Skeletor's eyes lit up. That's all the thing did. It was a dedicated talking Skeletor toy. It did one thing. There was nothing you could build around it. It wasn't like a bunch of soldiers that you could line up and generate heroic deeds with. There was only one thing it could do, and you were the least part of it. It was a McToy.

But you see a lot of that in videogames, where there are just a few things you can do. You feel like you're mastering something, but the game really has you extruding through a very narrow tube of experience.

I don't think it's healthy. After 12 years of making these games, I'm worried about what they might be doing to kids. That's why I want to make games that involve other human beings. I want the thing to be a relationship. That to me is more real. And, what can I say, I want to atone for the sins of *Night Trap*. ■ ■ ■

Ron Martinez's most recent day job is as vice president for creative development at Spectrum Holobyte in Alameda, California.

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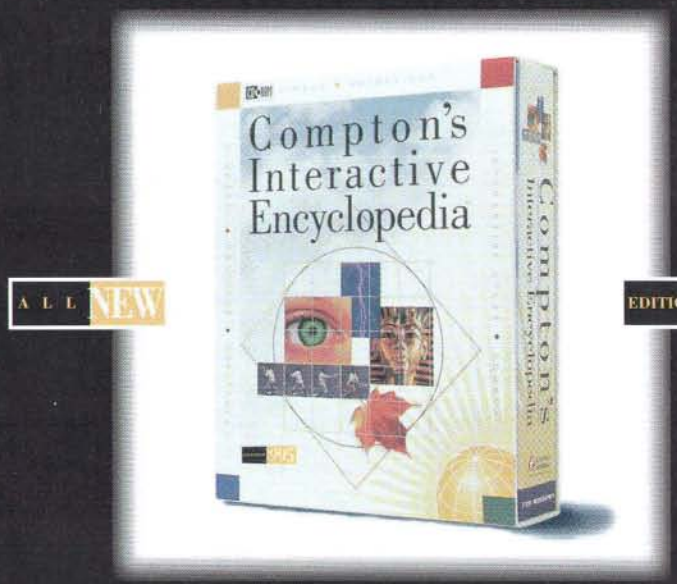

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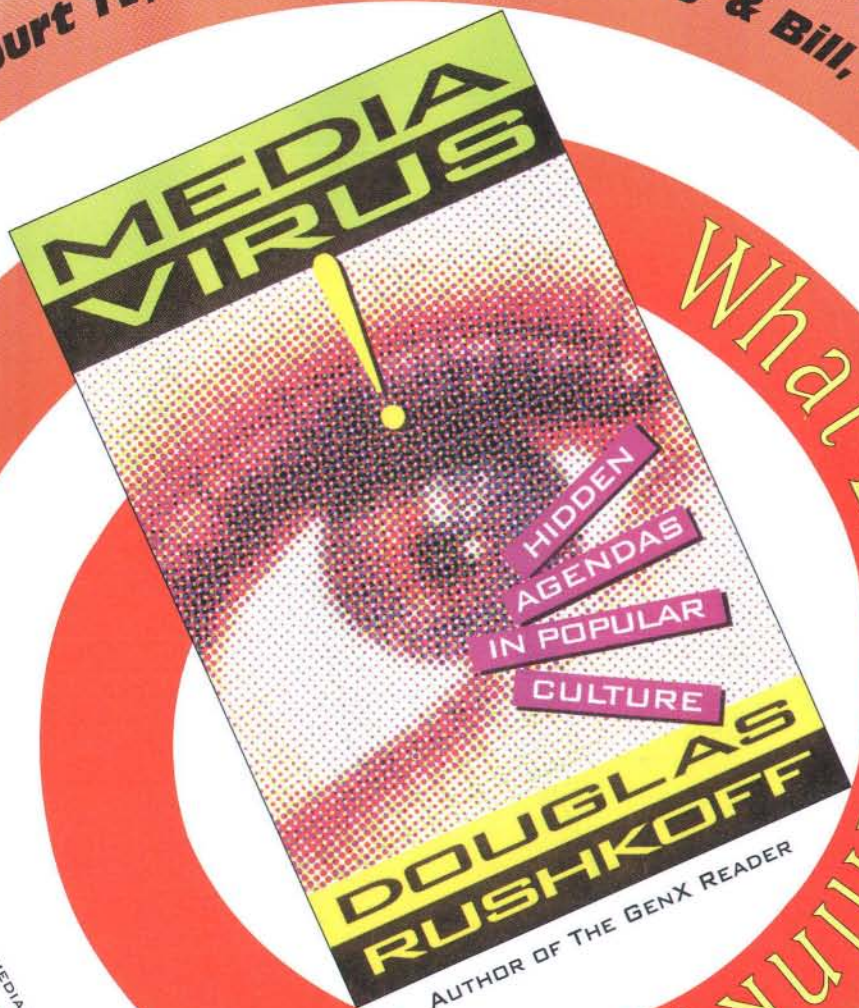

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Meme, Counter-meme

By Mike Godwin

Do we have an obligation to improve our informational environment?

It was back in 1990 that I set out on a project in memetic engineering. The Nazi-comparison meme, I'd decided, had gotten out of hand – in countless Usenet newsgroups, in many conferences on the Well, and on every BBS that I frequented, the labeling of posters or their ideas as "similar to the Nazis" or "Hitler-like" was a recurrent and often predictable event. It was the kind of thing that made you wonder how debates had ever occurred without having that handy rhetorical hammer.

Not everyone saw the comparison to Nazis as a "meme" – most people on the Net, as elsewhere, had never heard of "memes" or "memetics." But now that we're living in an increasingly information-aware culture, it's time for that to change. And it's time for net.dwellers to make a conscious effort to control the kinds of memes they create or circulate.

A "meme," of course, is an idea that functions in a mind the same way a gene or virus functions in the body. And an infectious idea (call it a "viral meme") may leap from mind to mind, much as viruses leap from body to body.

When a meme catches on, it may crystallize whole schools of thought. Take the "black hole" meme, for instance. As physicist Brandon Carter has commented in Stephen Hawkings's *A Brief History of Time: A Reader's Companion*: "Things changed dramatically when John Wheeler invented the term [black hole] ... Everybody adopted it, and from then on, people around the world, in Moscow, in America, in England, and elsewhere, could know they were speaking about the same thing." Once the "black hole" meme became commonplace, it became a handy source of metaphors for everything from illiteracy to the deficit.

By 1990, I had noticed, something similar had happened to the Nazi-comparison meme. Sure, there are obvious topics in which the comparison recurs. In discussions about guns and the Second Amendment, for example, gun-control advocates are periodically reminded that Hitler banned personal weapons. And birth-control debates are frequently marked by pro-lifers' insistence that abortionists are engaging in mass murder, worse than that of Nazi death camps. And in any newsgroup in which censorship is discussed, someone inevitably raises the specter of Nazi book-burning.

But the Nazi-comparison meme popped up elsewhere as well – in general discussions of law in misc.legal, for example, or in the EFF conference on the Well. Stone libertarians were ready to label any government regulation as incipient Nazism. And, invariably, the comparisons trivialized the horror of the Holocaust and the social pathology of the Nazis. It was a trivialization I found both illogical (Michael Dukakis as a Nazi? Please!) and offensive (the millions of concentration-camp victims did not die to give some net.blowhard a handy trope).

So, I set out to conduct an experiment – to build a counter-meme designed to make discussion participants see how they are acting as vectors to a particularly silly and offensive meme ... and perhaps to curtail the glib Nazi comparisons.

I developed Godwin's Law of Nazi Analogies: As an online discussion grows longer, the probability of a comparison involving Nazis or Hitler approaches one.

I seeded Godwin's Law in any newsgroup or topic where I saw a gratuitous Nazi reference. Soon, to my surprise, other people were citing it – the counter-meme was reproducing on its own! And it mutated like a meme, generating corollaries like the following:

► Gordon's Restatement of Newman's Corollary to Godwin's Law: Libertarianism (pro, con, and internal faction fights) is the primordial net.news discussion topic. Any time the debate shifts somewhere else, it must eventually return to this fuel source.

► Morgan's Corollary to Godwin's Law: As soon as such a comparison occurs, someone will start a Nazi-discussion thread on alt.censorship.

► Sircar's Corollary: If the Usenet discussion touches on homosexuality or Heinlein, Nazis or Hitler are mentioned within three days.

► Van der Leun's Corollary: As global connectivity improves, the probability of actual Nazis being on the Net approaches one.

► Miller's Paradox: As a network evolves, the number of Nazi comparisons not forestalled by citation to Godwin's Law converges to zero.

In time, discussions in the seeded newsgroups and discussions seemed to show a lower incidence of the Nazi-comparison meme. And the counter-meme mutated into even more useful forms. (As *Cuckoo's Egg* author Cliff Stoll once said to me: "Godwin's Law? Isn't that the law that states that once a discussion reaches a comparison to Nazis or Hitler, its usefulness is over?") By my (admittedly low) standards, the experiment was a success.

But its success had given me much to reflect on. If it's possible to generate effective counter-memes, is there any moral imperative to do so? When we see a bad or false meme go by, should we take pains to chase it with a counter-meme? Do we have an obligation to improve our informational environment? Our social environment?

But this power to do good may also be a power to do ill. Anyone on the Net has the power to affect stock prices. (Or worse: a fraudulent re-creation of the Tylenol-poisoning scare could cause a national or international panic.) And viral memes are capable of doing lasting damage.

While the world of the Net is filled with diverse critical thinkers who are ready to challenge self-indulgent or self-aggrandizing memes, we can't rely on net.culture's diversity and inertia to answer every bad meme. The Nazi-comparison meme has a peculiar resilience, in part because of its sheer inflammatory power ("You're calling me a Nazi? You're the Nazi in this discussion!") The best way to fight such memes is to craft counter-memes designed to put them in perspective. The time may have come for us to commit ourselves to memetic engineering – crafting good memes to drive out the bad ones.

Otherwise, *plus ça change, plus c'est la* meme *chose*.

Mike Godwin (mnemonic@eff.org) *is online counsel for the Electronic Frontier Foundation.*

Just Say No – To Cybercrats and Digital Control Freaks

By Mark Stahlman

The left-wing is dead. The right-wing is dead. Ideology is dead. Without any official proclamations, we're already living in a networked world economy.

Wake up: politics is in your face again. Hothouse cybersalons are busy incubating Information Age Manifestos, Magna Cartas, and Ultimatums. Congress is being congratulated for mandating sweeping FCC regulations in areas they don't understand – like multimedia networks. And a traveling band of bureaucrats is holding town meetings to drum up support for the War on Info-Poverty and to collect ideas on how to soak us all to pay for desperately needed Info-Stamps.

It is as Terence McKenna said: "The 1990s are just like the 1960s – only turned upside down." Now the hippies are the fat cats with fat bank accounts and even fatter appetites for talk-show fame. Just as flower-child Hillary wants to "fix" health care by running it from the basement of the White House, the Teflon Vice President, Al Gore, along with his Deadhead staff, wants to install his digital command center in the attic. Wait until he gets every school kid to join his Save-the-Environment-Youth-Corps and sends them out to take water samples to post on the Internet. (And you thought D.A.R.E. was frightening.) The Merry Pranksters go to Washington, indeed.

Haven't we learned anything? The job of career politicians is to get reelected – not to shrink government. Replacing Big Steel with Big Silicon doesn't change anything – it's still the same political system. Remember Clinton's promises to "reform" political contributions and ethics rules? Remember what happened to those promises?

Putting a Pink Floyd groupie on the FCC doesn't mean they'll back off and leave Howard Stern alone now. In our zeal to make our technologies and our digital culture mainstream, we've fallen into a trap – a very old trap. We've become co-opted. We've forgotten why we mistrusted government in the first place. We've fooled ourselves into thinking that we've won and that the "good guys" are fondling the levers of power now. We've become cyberdupes.

This administration plans to take over the network that our lives depend on. They say, "Sure, we'll let private enterprise build it. But in exchange for our generously granting construction permits, we want to control it." It's called Industrial Policy, and it doesn't work. This policy is going to be shoved down our throats – unless we stop it. That's right, we're the ones who have to stop it.

Why would anyone even consider allowing an assault like this on the Net? Why, it's all in the "public interest," of course. In speech after speech, Gore and Commerce Secretary Ron "no-ethics-violations-here" Brown hammer away at the coming tragedy of the information have-nots. "We'll never make it to the 21st century unless we bring all the citizens of this great land with us," say the pious digicrats. Do they ever spell out what an information have-not looks like? Or which new networked services are vital to democracy? Or why intervention is needed to make sure we make it safely to the millennium? They're still studying the matter.

This isn't a liberal versus conservative thing. Or even a left versus right thing. This doesn't fit any of the traditional categories, sects, "isms," or schisms. As befits the development of a profound new medium, we're beginning to write a completely new chapter in political history. Never before has a group of citizens with such global awareness, depth of experience, media sophistication, and healthy skepticism been handed such a massive opportunity. Without any official proclamations, we're already in the information age. We're no longer at war, and we live in a networked economy. The left-wing is dead. The right-wing is dead. Ideology is dead.

In place of the stale, 19th-century pre-cyber age ideologies that still provide coinage for "the system" (how could anyone still be proud to be identified as a socialist or a Jeffersonian or a libertarian?), proto-movements are beginning to form to tackle the far more radical politics of cyberspace. Take, for instance, DigitaLiberty. Still building momentum, DigitaLiberty attacks Clipper as a last ditch IRS assault on cybercommerce. Far from society protecting itself from porno-smuggling-kiddie-grabbing-terror-toting hairballs, DigitaLiberty pegs Clipper and its kin as frantic steps to back up tax collection in the metaverse. Think about it. When "the system" loses its legitimacy, just how many taxes do you plan to pay? What would a cyber age "nation state" look like (with 20 percent of its current tax revenues)?

Or, take the example of drafting a "Statement of Principle on Cyberspace and the American Dream." By asking "Is cyberspace the next frontier of American entrepreneurship ... or just a sandbox for second-wave bureaucrats?" George Gilder, Esther Dyson, Alvin Toffler, and dozens of others are trying to craft a platform for the politics of post-industrial society. Barbra Streisand wasn't invited to comment.

The EFF isn't part of these new politics. When it abandoned its initial grass-roots strategy, it abandoned the chance to build something vibrant outside of the current system. The EFF has become the system – complete with back-room deals and clouds of doublespeak.

When the House recently passed its telecom reform act, EFF praised it for "dramatically enhancing Americans' access to multimedia information sources." The bill, however, doesn't actually enhance access to anything (except policy-wonking by committee) – it mandates an open-ended series of reports on the open-ended topic of "open-platform services." EFF's open-platform policy triumph created a nightmare – an open door for federal industrial policy intervention into information markets.

Mark Stahlman (newmedia@mcimail.com) *is president of New Media Associates, a NewYork-based research and financial services firm.*

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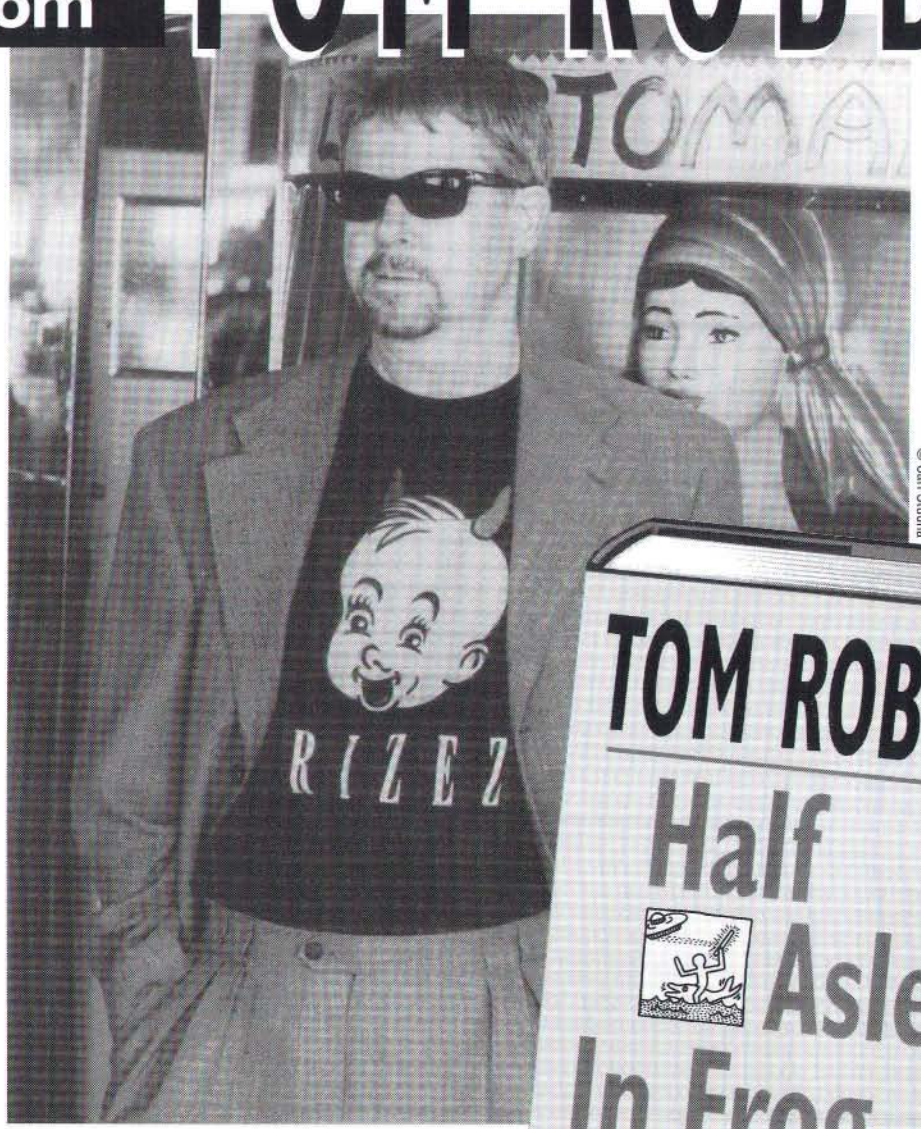

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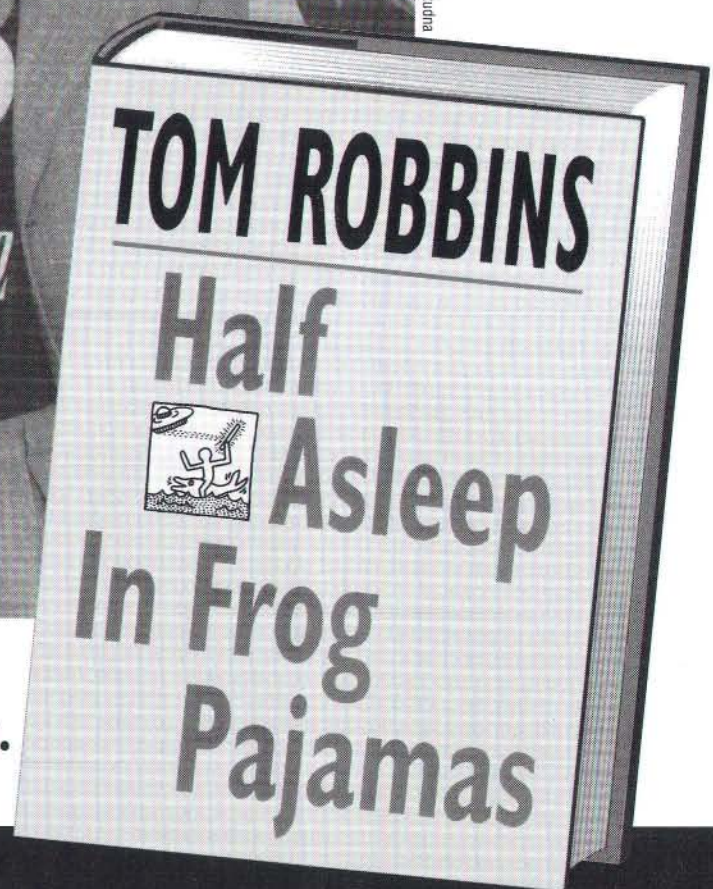

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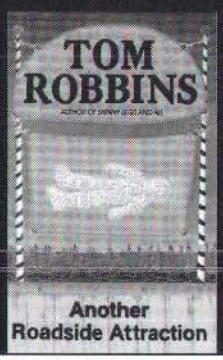

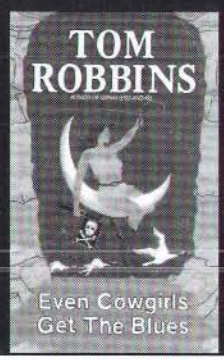

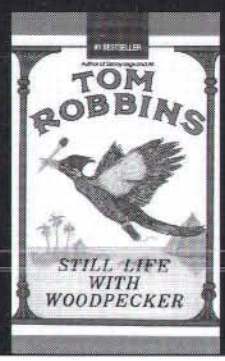

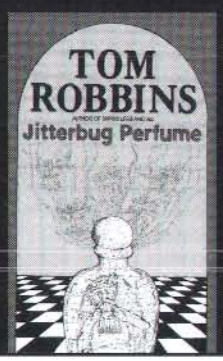

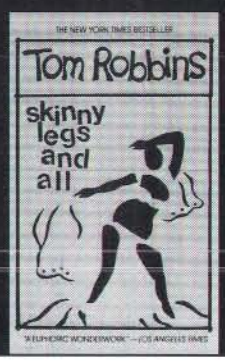

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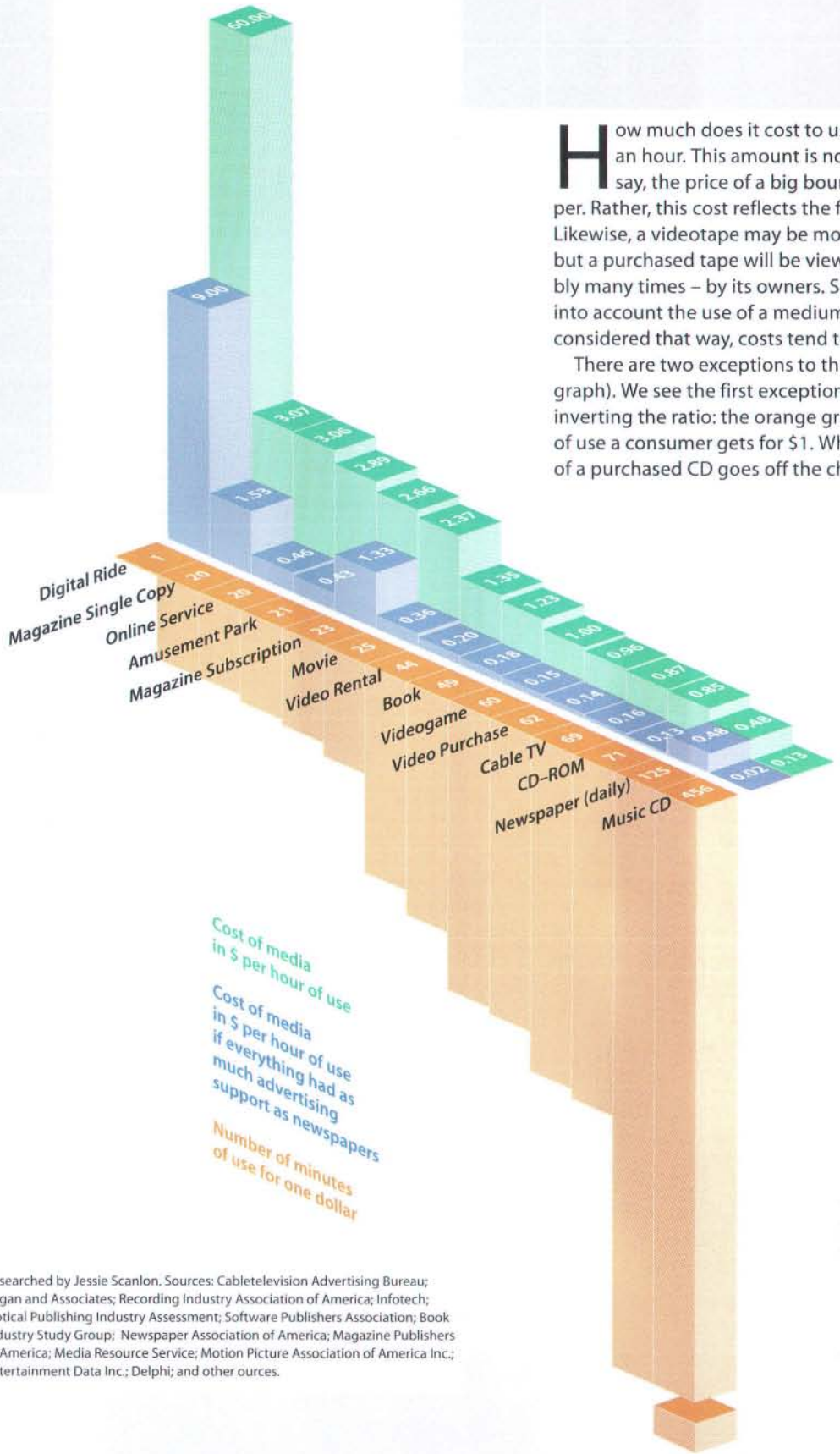
Two Dollars Per Hour

By Kevin Kelly



How much does it cost to use media today? Try two bucks an hour. This amount is not merely an average between, say, the price of a big bound book and a daily newspaper. Rather, this cost reflects the fact that the book lasts longer. Likewise, a videotape may be more pricey to buy than to rent, but a purchased tape will be viewed more than once – probably many times – by its owners. So the $2-per-hour figure takes into account the use of a medium over its functional lifetime; considered that way, costs tend to converge.

There are two exceptions to the two-dollar rule (the green graph). We see the first exception by taking the data and inverting the ratio: the orange graph maps how many minutes of use a consumer gets for $1. When viewed this way, the value of a purchased CD goes off the chart. A dollar's worth of this thin disc yields many hours of use. In fact, the true value of CDs is still in flux, because few of them have reached the end of their usefulness.

The other anomaly in media costs is the high price of digital rides, such as arcade virtual reality games, or of high-tech "location-based entertainment" theaters. At $1 per minute, such experiences are hugely overpriced compared with other media, including amusement park rides bought with a day-pass. We can expect the cost of digital rides to drop quickly – otherwise, they'll never become popular. This will probably be done by increasing the duration of the experience.

Advertising already subsidizes many broadcast and publishing media; the blue graph shows what various media would cost if their advertising revenues matched that of newspapers. A hardback book with as many ads as a newspaper would cost $3, a music CD $2, and a movie only 60 cents. On the other hand, if a magazine (say, this one) didn't have advertising, you'd pay about $15 an issue for it. Including advertising may be yet another way that makers of rides and virtual reality games can price their wares for the eager masses.

Researched by Jessie Scanlon. Sources: Cabletelevision Advertising Bureau; Kagan and Associates; Recording Industry Association of America; Infotech; Optical Publishing Industry Assessment; Software Publishers Association; Book Industry Study Group; Newspaper Association of America; Magazine Publishers of America; Media Resource Service; Motion Picture Association of America Inc.; Entertainment Data Inc.; Delphi; and other ources.

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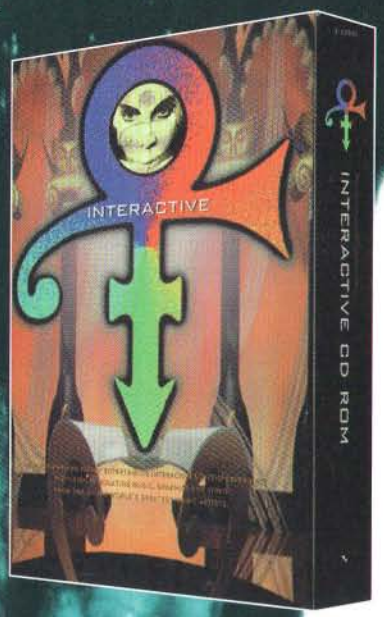
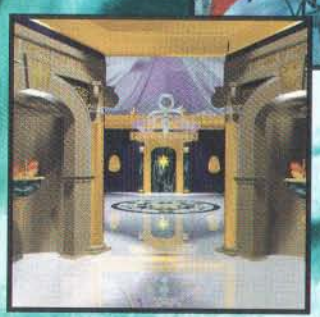


COME PLAY WITH ME.



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SPEW

NEW FICTION BY NEAL STEPHENSON

ARE YOU ON THE TRAIL OF THE NEXT UNEXPLOITED MARKET NICHE-
OR JUST ON A NOOKIE HUNT?

DAVID MCGLYNN

Yeah, I know it's boring of me to send you plain old Text like this, and I hope you don't just blow this message off without reading it.

But what can I say, I was an English major. On video, I come off like a stunned bystander. I'm just a Text kind of guy. I'm gambling that you'll think it's quaint or something. So let me just tell you the whole sorry tale, starting from the point where I think I went wrong.

I'd be blowing brown smoke if I said I wasn't nervous when they shoved in the needles, taped on the trodes, thrust my head into the Big Cold Magnet, and opened a channel direct from the Spew to my immortal soul. Of course they didn't call it the Spew, and neither did I – I wanted the job, after all. But how could I not call it that, with its Feeds multifarious as the glistening strands cascading sunnily from the supple scalps of the models in the dandruff shampoo ads.

I mention that image because it was the first thing I saw when they turned the Spew on, and I wasn't even ready. Not that anyone could ever *get ready* for the dreaded Polysurf Exam. The proctors came for me when *they* were ready, must have got my address off that job app yellowing in their infinite files, yanked me straight out of a fuzzy gray hangover dream with a really wandering story arc, the kind of dream concussion victims must have in the back of the ambulance. I'd been doing shots of vodka in the living room the night before, decided not to take a chance on the stairs, turned slowly into a mummy while I lay comatose on our living-room couch – the First Couch Ever Built, a Couch upholstered in avocado Orlon that had absorbed so much tar, nicotine, and body cheese over the centuries that now the centers of the cushions had developed the black sheen of virgin Naugahyde. When they buzzed me awake, my joints would not move nor my eyes open: I had to bolt four consecutive 32-ounce glasses of tap water to reconstitute my freeze-dried plasma.

Half an hour later I'm in Television City. A million stories below, floes of gray-yellow ice, like broken teeth, grind away at each other just below the surface of the Hudson. I've signed all the releases and they're lowering the Squid helmet over me, and without any warning BAM the Spew comes on and the first thing I see is this model chick shaking her head in ultra-slow-mo, her lovely hairs gleaming because they've got so many spotlights cross-firing on her head that she's about to burst into flame, and in voice-over she's talking about how her dandruff problem is just a nasty, embarrassing memory of adolescence now along with pimples and (if I may just fill in the

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Neal Stephenson has written several novels, some of which have actually been published: Zodiac: The Eco-Thriller *and* Snow Crash. The Diamond Age *will be released early next year by Bantam.*

blanks) screwing skanky guys who'll never have a salaried job. And I think she's cute and everything but it occurs to me that this is really kind of sick – I mean, this chick has *admitted* to a history of shedding *blizzards* every time she moved her head, and here she is *getting down* under eight megawatts of color-corrected halogen light, and I just *know* I'm supposed to be thinking about *how much head chaff* would be sifting down in her personal space right now if she hadn't ditched her old hair care product lineup in favor of –

Click. Course, it never really clicks anymore, no one has used mechanical switches since like the '50s, but some Spew terminals emit a synthesized click – they wired up a 1955 Sylvania in a digital sound lab somewhere and had some old gomer in a tank-top stagger up to it and change back and forth between Channel 4 and Channel 5 a few times, paid him off and fired him, then compressed the sound and inseminated it into the terminals' fundamental ROMs so that we'd get that reassuring *click* when we jumped from one Feed to another. Which is what happens now; except I haven't touched a remote, don't even *have* a remote, that being the whole point of the Polysurf. Now it's some fucker picking a banjo, *ouch* it is an actual *Hee Haw* rerun, digitally remastered, frozen in pure binary until the collapse of the Universe.

Click. And I resist the impulse to say, "Wait a minute. *Hee Haw* is my favorite show."

Well, I have lots of favorite shows. But me and my housemates, we're always watching *Hee Haw.* But all I get is two or three twangs of the banjo and a glimpse of the eerily friendly grin of the banjo picker and then *click* it's a '77 Buick LeSabre smashing through a guardrail in SoCal and bursting into a fireball *before it has even touched the ground,* which is one of my favorite things about TV. Watch that for a while and just as I am settling into a nice Spew daze, it's a rap video, white trailer park boys in Clackamas who've actually got their moho on hydraulics so it can tilt and bounce in the air while the homeboys are partying down inside. Even the rooftop sentinels are boogieing, they have to boogie, using their AK-47s like jugglers' poles to keep their balance. Under the TV lights, the chrome-plated bayonets spark like throwaway cameras at the Orange Bowl Halftime Show.

And so it goes. Twenty clicks into the test I've left my fear behind, I'm Polysurfing like some incarnate sofa god, my attention plays like a space laser across the Spew's numberless Feeds, each Feed a torrent, all of them plexed together across the panascopic bandwidth of the optical fiber as if the contents of every Edge City in Greater America have been rammed into the maw of a giant pasta machine and extruded as endless, countless strands of polychrome angel hair. Within an hour or so I've settled into a pattern without even knowing it. I'm surfing among 20 or so different Feeds. My subconscious mind is like a retarded homunculus sacked out on the couch of my reptilian brain, his thumb wandering crazily around the keypad of the world's largest remote control. It looks like chaos, even to me, but to the proctors, watching all my polygraph traces superimposed on the video feed, tracking my blood pressure and pupil dilation, there is a strange attractor somewhere down there, and if it's the right one....

"Congratulations," the proctor says, and I realize the chilly mind-sucking apparatus has been retracted into the ceiling. I'm still fixated on the Spew. Bringing me back to reality: the nurse chick ripping off the handy disposable self-stick electrodes, bristling with my body hair.

YOU'VE BLOWN MANY SCARCE DOLLARS AT YOUR LOCAL BODYMOD FRANCHISE GETTING YOURSELF PIERCED

So, a week later I'm still wondering how I got this job: patrolman on the information highway. We don't call it that, of course, the job title is Profile Auditor 1. But if the Spew is a highway, imagine a hard-jawed, close-shaven buck lurking in the shade of an overpass, your license plate reflected in the quicksilver pools of his shades as you whoosh past. Key difference: we never bust anyone, we just like to watch.

We sit in Television City cubicles, VR rigs strapped to our skulls, grokking people's Profiles in n-dimensional DemoTainment Space, where demographics, entertainment, consumption habits, and credit history all intersect to define a weird imaginary universe that is every bit as twisted and convoluted as those balloon animals that so eerily squelch and shudder from the hands of feckless loitering clowns in the touristy districts of our great cities. Takes killer spatial relations not to get lost. We turn our heads, and the Demosphere moves around us; we point at something of interest – the distinct galactic cluster formed by some schmo's Profile – and we fly toward it, warp speed. Hell, we fly right through the middle of it, we do barrel rolls through said schmo's annual mortgage interest statements and gambol in his urinalysis records. Course, the VR illusion doesn't track just right, so most of us get sick for the first few weeks until we learn to move our heads slowly, like tank turrets. You can always tell a rookie by the scope patch glued beneath his ear, strong mouthwash odor, gray lips.

Through the Demosphere we fly, we men of the Database Maintenance Division, and although the Demosphere belongs to General Communications Inc., it is the schmos of the world who make it – every time a schmo surfs to a different channel, the Demosphere notes that he is bored with program A and more interested, at the moment, in program B. When a schmo's paycheck is delivered over the I-way, the number on the bottom line is plotted in his Profile, and if that schmo got it by telecommuting we know about that too – the length of his coffee breaks and the size of his bladder are an open book to us. When a schmo buys something on the I-way it goes into his Profile, and if it happens to be something that he recently saw advertised there, we call that interesting, and when he uses the I-way to phone his friends and family, we Profile Auditors can navigate his social web out to a gazillion fractal iterations, the friends of his friends of his friends of his friends, what they buy and what they watch and if there's a correlation.

So now it's a year later. I have logged many a megaparsec across the Demosphere, I can pick out an anomalous Profile at a glance and notify my superiors. I am dimly aware of two things: (1) that my yearly Polysurf test looms, and (2) I've a decent chance of being promoted to Profile Auditor 2 and getting a cubicle some 25 percent larger and with my choice from among three different color schemes and four pre-approved decor configurations. If I show some stick-to-it-iveness, put out some Second Effort, spread my legs on cue, I may one day be issued a *chair with arms.*

But let's not get ahead of ourselves. Have to get through that Polysurf test first. And I am oddly nervous. I am nervous because of *Hee Haw.*

Why did my subconscious brain surf away from *Hee Haw*? That wasn't like me at all. And yet perhaps it was this that had gotten me the job.

Disturbing thought: the hangover. I was in a foul mood, short-tempered, reactionary, literal-minded – in short, the temporary brain insult had turned me into an ideal candidate for this job.

But this time they will come and tap me for the test at a random time, while I am at work. I cannot possibly arrange to be hung over, unless I *stay* hung over for two weeks straight – tricky to arrange. I am a fraud. Soon they will know; ignominy, poverty will follow.

I am going to lose my job – my salaried job with medical and dental and even a *pension plan*. Didn't even know what a pension was until the employee benefits counselor clued me in, and it nearly blew the top of my skull off. For a couple of weeks I was like that lucky conquistador from the poem – stout what's-his-name silent upon a peak in Darien – as I dealt this wild surmise: 20 years of rough country ahead of me leading down to an ocean of Slack that stretched all the way to the sunlit rim of the world, or to the end of my natural life expectancy, whichever came first.

So now I am scared shitless about the next Polysurf test. And then, hope.

My division commander zooms toward me in the Demosphere, an alienated human head wearing a bowler hat as badge of rank. "Follow me, Stark," he says, launching the command like a bronchial loogie, and before I can even "yes sir" I'm trying to keep up with him, dodging through DemoTainment Space.

And 10 minutes later we are cruising in a standard orbit around your Profile.

And from the middle distance it looks pretty normal. I can see at a glance you are a 24-year-old single white female New Derisive with post-Disillusionist leanings, income careening in a death spiral around the poverty line, you spend more on mascara than is really appropriate compared to your other cosmetics outlays, which are Low Modest – I'd wager you're hooked on some exotic brand – no appendix, O positive, HIV-negative, don't call your mother often enough, spend an hour a day talking to your girlfriends, you prefer voice phone to video, like Irish music as well as the usual intelligent yet primal, sludgy yet danceable rock that someone like you would of course listen to. Your use of the Spew follows a bulimic course – you'll watch for two days at a time and then not switch on for a week.

But I know it can't be that simple, the commander wouldn't have brought me here because he was worried about your mascara imbalance, there's got to be something else.

I decide to take a flyer. "Geez, boss, something's not right here," I say, "this profile looks normal – *too* normal."

He buys it. He buys it like a set of snow tires. His disembodied head spins around and he looks at me intently, an oval of two-dimensional video in DemoTainment Space. "You saw that!?" he says.

Now I'm in deep. "Just a hunch, boss."

"Get to the bottom of it, and you'll be picking out color schemes by the end of the week," he says, then streaks off like a bottle rocket.

So that's it then; if I nab myself a promotion before the next Polysurf, they'll be a lot more forgiving if, say, the little couch potato in my brain stem chooses to watch *Hee Haw* for half an hour, or whatever.

Thenceforward I am in full Stalker Mode, I stake out your Profile, camp out in the middle of your income-tax returns, dance like an arachnid through your Social Telephony Web, dog you through the Virtual Mall trying to predict what clothes you're going to buy. It takes me about 10 minutes to figure out you've been buying mascara for one of your girlfriends who got fired from her job last year, so that solves that little riddle. Then I get nervous because whatever weirdness it was about you that drew the Commander's attention doesn't seem to be there anymore. Almost like you know someone's watching.

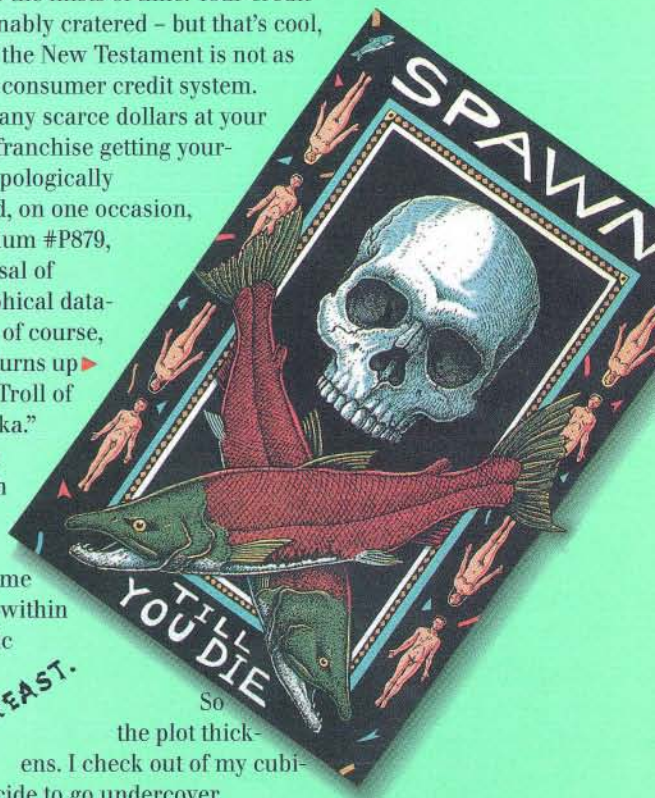
OK, let's just get this out of the way: it's creepy. Being a creep is a role someone has to take for society to remain free and hence prosperous (or is it the other way around?).

I am pursuing a larger goal that isn't creepy at all. I am thinking of Adderson. Every one of us, sitting in our cubicles, is always thinking of Adderson, who started out as a Profile Auditor 1 just like us and is now Vice President for Dynamic Programming at Dynastic Communications Inc. and making eight to nine digits a year depending on whether he gets around to exercising his stock options. One day young Adderson was checking out a Profile that didn't fit in with established norms, and by tracing the subject's social telephony web, noticed a trend: Post-Graduate Existentialists who *started going to church*. You heard me: Adderson single-handedly discovered the New Complacency.

It was an unexploited market niche of cavernous proportions: upwards of one-hundredth of one percent of the population. Within six hours, Adderson had descended upon the subject's moho with a Rapid Deployment Team of entertainment lawyers and development assistants and launched the fastest-growing new channel ever to wend its way into the thick braid of the Spew.

I'm figuring that there's something about you, girl, that's going to make me into the next Adderson and you into the next Spew Icon – the voice of a generation, the figurehead of a Spew channel, a straight polished shaft leading direct to the heart of a *hitherto unknown and unexploited market*. I know how awful this sounds, by the way.

So I stay late in my cubicle and dig a little deeper, rewinding your Profile back into the mists of time. Your credit record is fashionably cratered – but that's cool, even the God of the New Testament is not as forgiving as the consumer credit system. You've blown many scarce dollars at your local BodyMod franchise getting yourself pierced ("topologically enhanced"), and, on one occasion, tattooed: a medium #P879, left breast. Perusal of BodyMod's graphical database (available, of course, over the Spew) turns up "©1991 by Ray Troll of Ketchikan, Alaska." BodyMod's own market research on this little gem indicates that it first became widely popular within the Seattle music scene.



AND ON ONE OCCASION, TATTOOED: A MEDIUM #P879, LEFT BREAST.

So the plot thickens. I check out of my cubicle. I decide to go undercover.

Wouldn't think a Profile Auditor 1 could pull that off, wouldja? But I'm just like you, or I was a year ago. All I have to do is dig a yard deeper into the sediments of my dirty laundry pile, which have become metamorphic under prolonged heat and pressure.

As I put the clothes on it occurs to me that I could stand a little prolonged heat and pressure myself.

But I can't be thinking about *that*, I'm a professional, got a job to do, and frankly I could do without this unwanted insight. That's 142 ▶

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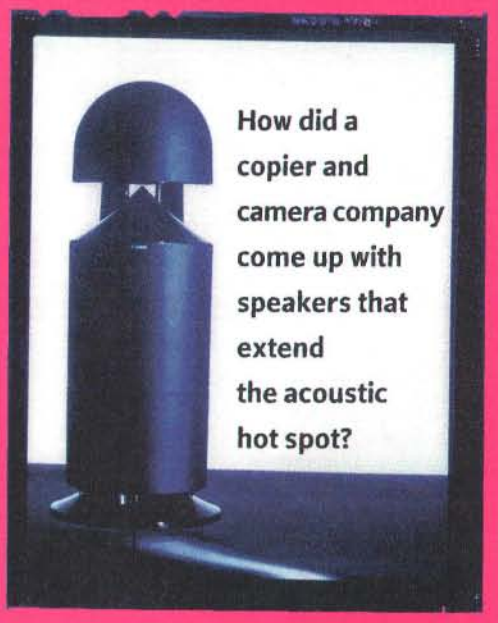
How did a copier and camera company come up with speakers that extend the acoustic hot spot?

KODAK PRZ 2048
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PRZ 2048

Or the world's largest production-model flat panel display, based on technology many say is impossible to work with?

KODAK PRZ 2048
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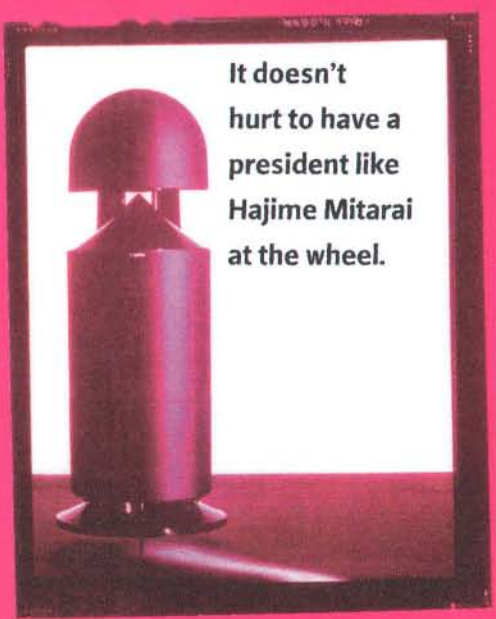
PRZ 2048


It doesn't hurt to have a president like Hajime Mitarai at the wheel.

CANON, LONE WOLF

By Bob Johnstone

Sometime this fall, at a sparkling new factory in the small Tokyo Bay town of Hiratsuka, a bunny-suited engineer will push a button, and a mobile robot will sally forth bearing thin sheets of glass for the first batch of the biggest liquid crystal display screens ever mass-produced. At 15 inches, these flat panels are half again as big as current state-of-the-art displays. They are based on an unconventional technology, known as ferroelectrics, which requires manufacturing skills of almost unbelievable precision. And they are made by a company with no previous experience in the display business.

That company is Canon, corporate dissident. Reinventing the wheel is supposed to be a dumb thing to do, but not the way Canon does it. Consider: Canon reinvented the 35mm camera, then the copier, then the printer (twice). And now, the liquid crystal display. Each time, the company has proceeded by developing original technology, surrounding it with patents, then using the period of patent protection to achieve dramatic economies of scale in manufacturing. Thus, even when the patents expire, would-be competitors still face a formidable barrier.

The best example of Canon's dissident strategy in action is the laser printer engine. If the printer you use is a Hewlett-Packard LaserJet or an Apple LaserWriter, to name just the two best-known brands, then a Canon laser engine is probably doing your printing. Indeed, without Canon it is doubtful laser printers would ever have become an affordable item. [See page 99.]

Measured by number of US patents awarded, Canon can claim to be the world's most consistently creative company. "It's remarkable," comments Steve Myers, a Tokyo-based analyst at Jardine Fleming Securities. "For a fifth of the R&D budget, Canon has obtained about as many patents as IBM. Year after year, Canon has averaged more than one US patent per million dollars of R&D investment. No other company comes close to this standard of efficiency."

Most recently, Canon has demonstrated that it can also harness creativity outside Japan. Unexpected new prototypes and products – software as well as hardware – are popping out of the company's laboratories in the US, the UK, and Australia. Of course, when it comes to globalizing R&D, it helps to have a president like Hajime Mitarai. Mitarai has a doctorate in electrical engineering from Stanford University. Before joining Canon he worked for a US semiconductor firm – Signetics – in Silicon Valley.

As can be expected with such a big outfit – the company had sales of US$16.4 billion in fiscal 1993 – Canon has also had its share of embarrassments, especially in the computer business. Most notably, it supplied NeXT's Steve Jobs with at least $140 million, and possibly as much as $200 million, then failed to keep tabs on how Jobs spent the cash. In fact, Canon has a history of being much better at making products than at marketing them. Most recently, with low-cost inkjet printers, Canon won the race to the patent office, only to lose out to Hewlett-Packard on the way to the marketplace.

No *Keiretsu*, Thanks

Conventional wisdom says that all Japanese companies are alike. But a recent survey from a Harvard University team led by former IBM chief scientist Lewis Branscomb came to the unexpected conclusion that there are more differences in corporate culture between individual Japanese firms than between US ones. Regardless of how many Japanese firms run with the pack, there remain some lone wolves. Canon is an extreme example of this latter category. "We don't want to make what everyone else does," asserts Canon director Takashi Saito. The company is not a member of a *keiretsu*, the corporate groupings to which most big Japanese firms belong. On a personal level, it emphasizes individual effort over teamwork. Canon moves faster than local rivals because its managers make decisions on the spot, not by building consensus. And in a country where lifelong employment is the norm in big corporations, Canon welcomes mid-career hires – especially when they bring new technological skills.

Most Japanese firms run with the pack. Not Canon. It's not a member of a cartel-like *keiretsu*. And it emphasizes individual effort over teamwork. Could that be why it runs the most productive R&D effort in the world?

Founded in 1933, the company more or less fell apart during World War II, to be reconstituted later by a most unusual man. Takeshi Mitarai, the current president's father, was an obstetrician who had bankrolled some renegade Japanese engineers in their quixotic attempt to build the world's best camera. He reluctantly stepped in as president of the fledgling firm because no one else would take on the job. Dr. Mitarai knew nothing about business and was not about to learn. Instead, he delegated responsibility to bright young protégés in their mid-30s, an outrageously precocious age in a country where seniority is paramount. Canon would eventually achieve its original goal in 1976 with the AE-1, the first microprocessor-controlled camera, which quickly became the bestselling single lens reflex in the world. But fierce competition kept profit margins wafer thin. Camera makers couldn't help noticing that it was a different story for film producers like Kodak. "With cameras, you're really doing work for the film companies," the younger Mitarai explains. "We call cameras 'film burners,' because no matter how you do it, only the film makers make money."

Bob Johnstone (bobjohnstone@twics.com), Wired*'s Japan correspondent, reports on technology trends in the Pacific Rim. His article on Acer, "Me-Too Is Not My Style," appeared in* Wired *2.09.*

Was there not some product for which the same company made both the image-capturing part and the medium upon which it was captured? Well, yes there was: the products were called copiers – but an American firm called Xerox Corporation had a monopoly on them. Curious to know more, Canon acquired a 1962 report by a consultant in the US; it concluded that the patent wall surrounding Xerox technology would never be broken. To one of Canon's young turks, a 35-year-old R&D manager named Keizo Yamaji, the statement read like a challenge. "I had objections to that," Yamaji told the authors of *Xerox: American Samurai* in 1985. "I said, 'Let's try to break it.'" To take on one of America's most successful companies was an extraordinarily bold decision for a small Japanese firm. Breaking the Xerox monopoly on copiers took Canon six years, but the company did it, introducing in 1968 the first alternative to xerography.

Make a Canon and File the Original

In order to be successful, a personal copier would not only have to be cheap, it would also have to be virtually service free. Canon's revolutionary solution was to include all the key components in a replaceable cartridge.

Breaking the Xerox monopoly is the defining event in Canon's corporate history. As a late entrant in the copier market, Canon was forced to concentrate on niches where Xerox was weak. One of these was the low end, which Canon attacked with a series of progressively smaller machines, culminating, in 1982, with the launch of the personal copier. Copiers were notorious for breaking down, a propensity Xerox exploited by charging for service calls. Yamaji realized that to be successful, a personal copier would not only have to be cheap, it would also have to be virtually service free. Canon's revolutionary solution was to include all the key components – drum, charger, toner, and cleaner – in a replaceable cartridge. As it turned out, this was not just a good idea for copiers, it was also a great one for laser printers, where "service free" was even more of a priority. "It's a small thing," says Hajime Mitarai, "but if you have to pick a single factor that contributed most to the success of the laser printer, it's this cartridge idea, which was our invention." Printers and copiers now account for 80 percent of Canon's sales; cameras just 10 percent.

A second niche Canon pioneered is color copying, introducing its first color machine – a hybrid of copier and laser technologies – in 1987. For a long time, the only customers for color copiers were design studios and pro shops. Now, as the prices of the machines drop and as color becomes the norm for common applications like business presentations, color copiers are working their way into networks of office equipment. Once again, Canon leads the way at the low end with its line of entry-level "bubblejet" copiers. ("Inkjet" is the generic term for this category; "bubblejet" is a Canon trademark.)

The bubblejet principle was invented in 1977 by a Canon researcher in classic, accidental fashion. The tip of his hot soldering iron happened to touch the needle of a syringe charged with ink. The heat formed a bubble, and the bubble squirted a jet of ink out the end. Especially when compared with the laser printer, the beauty of the bubblejet is its simplicity. The print head can be mass-produced cheaply, its microscopic nozzles drilled clean as a whistle by an eximer laser. Canon has gone to town refining bubblejet technology, including the development of rapid-drying inks that do not bleed into each other and that give Canon machines the edge in quality over rival Hewlett-Packard. But in the marketplace, Canon has been comprehensively outmaneuvered by Hewlett-Packard, whose printers have grabbed 80 percent of the $1.6 billion color inkjet market. This market is exploding – International Data Corporation expects it to grow 64 percent this year – and Canon is determined to catch up. To head its bubblejet products operation, the company has picked an exceptionally confident executive, Takashi Saito.

"Color will become natural for business applications, for example, adding emphasis to a spreadsheet," Saito says. Beyond business, he adds, "our next target is in-home printing – printers that can pull images off the television will be a must-have." But penetrating the home market means making printers that sell for less than $500, the current price for low-end models. "It's a very challenging target," says Saito. But, he adds with a grin, Canon wants to do it precisely because of the challenge.

Of Bubblejets and Ferroelectrics

Of course, Hewlett-Packard is targeting the home market, too. But, as analyst Steve Myers points out, even if Canon fails to best Hewlett-Packard in inkjet printers, it won't be the end of the world for the Japanese. "The real kicker for Canon," he says, "is when it comes to buying color copiers." Myers believes that the increasing popularity of low-cost color printing will stimulate the growth of the color copier market. Since inkjet printing is intrinsically slow, people will look to color copiers when they need speed and volume.

At the same time, increasing use of color will also stimulate demand for flat panel screens. High-resolution color monitors hog desk space. But despite tremendous efforts, high-end flat panels are still prohibitively expensive for most applications.

To get high resolution and the fast switching speeds that video requires, most Japanese LCD makers have put a thin-film transistor behind each pixel. This makes such screens costly and difficult to manufacture. (The human eye is unforgiving: one dud transistor out of a million can mean having to junk the whole display. Industry insiders joke grimly about the "glass mountain" behind most LCD factories.)

Canon's approach does away with the need for transistors by employing new materials called ferroelectric liquid crystals. These switch quickly, and once switched, retain the new image without having to be refreshed. Canon began investigating ferroelectrics 12 years ago. Starting this fall, the Hiratsuka factory will produce 10,000 15-inch screens a month, then it will move to 21- and 24-inch models. "Our dream is to do high-definition, television-level resolution," says Hirokuni Kawashima, the soft-spoken manager who runs Canon's display business. "We think that with ferroelectric materials, we have plenty of room to do it."

The advantages of ferroelectrics have been known for almost 20 years, but thus far no one has dared to try mass-producing screens based on them. To strut their stuff, ferroelectrics need to be sandwiched between glass plates just one micron – one-thousandth of a millimeter –

apart. That is approximately one-tenth of the gap used in conventional LCDs. Kawashima says that maintaining such a gap across a 15-inch screen is equivalent to covering the entire surface of the Tokyo Dome baseball ground with two layers of astroturf one millimeter apart. "It really is a very difficult technology," he says.

An Unusual R&D Mission

Want stereo sound? Ask any hi-fi buff, they'll tell you: you have to sit in the "hot spot." At the apex, that is, of an equilateral triangle formed by you and your two speakers. Move even slightly to either side and the stereo illusion collapses onto the nearest speaker, leaving you with boring old mono. Hiro Negishi, the inventor of wide-imaging stereo and the director of Canon's European Research Center in Guildford, England, has the solution to the hot-spot problem. In 1984, Hajime Mitarai, then Canon's director of R&D, dispatched Negishi to England with a mandate to exploit local strengths by making them the basis of new businesses. It didn't take Negishi long to discover that one of the UK's strong points was high-end audio equipment. In due course, he also discovered the hot-spot problem. And the corporate dissident in him rose to the challenge.

By background, Negishi is a chemical engineer. But he works for a company whose specialty is optics, and since light and sound both travel in waves, it was natural to try to apply the principles of optics to audio. Low-frequency sound radiates from a speaker evenly, but high-frequency sound is directional, behaving much like a searchlight. So the key to solving the hot-spot problem was to find a way of spreading the high frequencies across a wider area. Negishi came up with the idea of using a cone-shaped acoustic mirror to reflect the sound. To manufacture and market wide-imaging stereo speakers, Canon formed a new UK subsidiary, Canon Audio. US marketing of the black, mushroom-like speakers began in April.

Canon has since spun off a second subsidiary, Criterion Software, from its UK lab. Its RenderWare package enables developers to write interactive 3-D applications that do not need any special hardware – such as graphics accelerator boards – in order to run. As with Canon Audio, Criterion is staffed entirely by Brits.

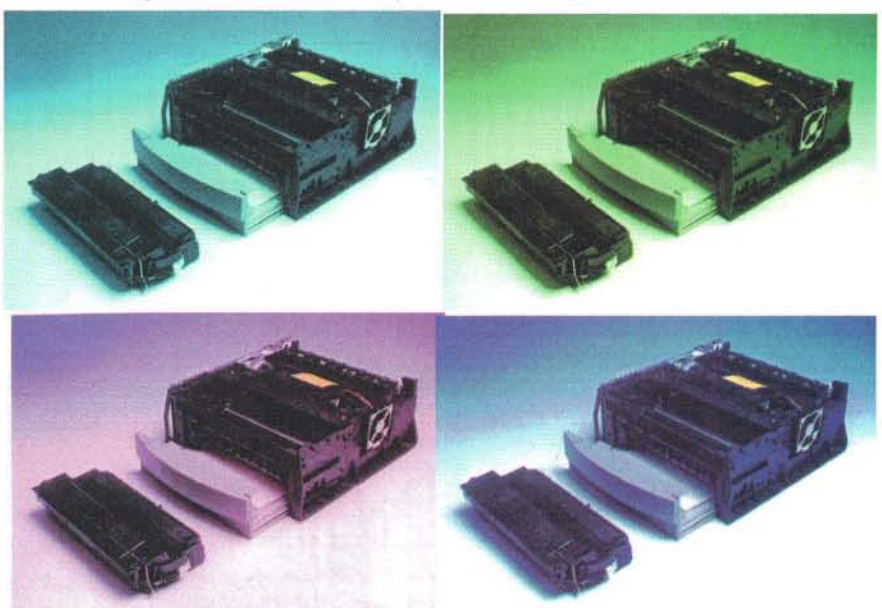
A multinational company establishing overseas laboratories is nothing new. Firms like IBM, for example, have long run research centers all over the world. But foreign labs typically perform low-level functions, like localizing products to suit nearby markets. Using them to generate new products, as Canon does, is different. And the labs are proving prolific. "We keep coming up with things they didn't expect," chortles Kia Silverbrook, director of Canon's 70-person Australian lab in New South Wales. Take PageCraft, a software package the Aussies developed to make life easier for first-time desktop publishers.

In places like the UK and Australia, Canon has few problems recruiting talented researchers, because business opportunities there for such people are limited. But in the US, and especially in high-tech hog heaven, Silicon Valley, where Canon set up its American Research Center, the job market is much more competitive. So, to scout directors for the Silicon Valley center, Mitarai re- 147 ►

Case Study: Inventing the Laser Printer

Last September, Canon President Hajime Mitarai traveled to Hewlett-Packard's plant in Boise, Idaho, to celebrate 10 million Hewlett-Packard LaserJet printers shipped, every one of them packing a Canon engine. Mitarai planted some cherry trees, then gave a little speech. He reviewed the relationship between the two firms, now almost 20 years old, remarking that business-school professors can't understand why it works so well.

The academics should take a closer look. The story of the laser printer, the now-commonplace machine most offices use to produce high-quality documents, is a classic. It provides a perfect illustration of how technology moves from the laboratory to the marketplace. Not smoothly, as part of some grand corporate plan, but in fits and starts, dragged forward by determined individuals, often over the dead bodies of their management. In particular, the laser printer is the story of four individuals: Garry Starkweather of Xerox, who invented it; Takashi



Kitamura of Canon, who made it affordable; and Dick Hackborn of Hewlett-Packard and Bob Belleville of Apple, who just had to have it.

The first thing to remember about the laser printer is that it is a modified copier. "Had Xerox not had a copier technology," Starkweather observes, "it would have been very difficult to get the laser printer out, because all the costs of a marking engine with the drums and the materials and everything were already in place." At Canon, he might have added, as well as at Xerox. What Starkweather changed was the way that images were written on the light-sensitive drum, substituting a laser for the copier's lamp. Then he developed an ingenious way of scanning the laser beam across the drum, reflecting it back and forth via a set of rapidly rotating mirrors on a shaft. Management at Xerox was unimpressed.

Instructed to stop work on it, Starkweather continued to improve the technology under the table. For a while it looked like he might have to leave Xerox to carry on with his work. Then he picked up a copy of the company newspaper and read an item about Xerox, based in Stamford, Connecticut, forming a new research center out in Palo Alto, California. It turned 148 ►

The head of MIT's Visible Language Workshop had a lasting impact on how we design for dynamic media.

Muriel Cooper's Legacy

By Wendy Richmond

Imagine swooping into a typographic landscape: hovering above a headline, zooming toward a paragraph in the distance, spinning around and seeing it from behind, then diving into a map. A virtual reality that has type and cartography and numbers, rather than objects – it's like no landscape you've ever traveled before, yet you feel completely at home.

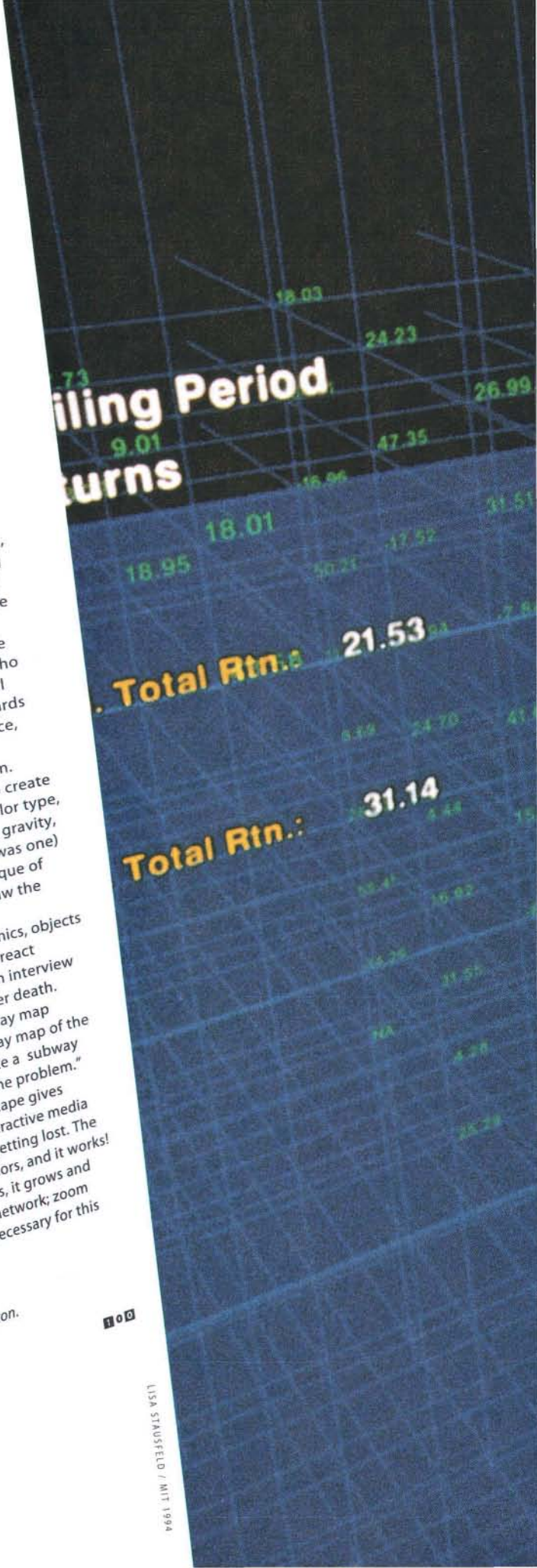
This is Muriel Cooper's world. It is just one of the creations of MIT's Visible Language Workshop, the research lab she directed for 20 years. Cooper, who died recently at the age of 68, co-founded the workshop with Ron MacNeil in 1973. Already famous in the design world, Cooper won prestigious awards for graphic design created at her own studio, at the MIT publications office, and at the MIT Press.

Cooper saw typography as a prime element for visual experimentation. Students and staff at the workshop developed a whole range of tools to create type that responds to its content and its environment. There is watercolor type, which responds to virtual paper – the fibers and pigment of the paper, gravity, and the amount of water applied. Cooper encouraged her students (I was one) to borrow metaphors from other media, like using pull focus, a technique of blurring less important type and bringing other type into focus to draw the reader's attention.

Now, take this a level further. Think about very smart text and graphics, objects that not only know how to react visually to content but also how to react structurally. Cooper described this "programming by example" in an interview with Ellen Lupton of Cooper-Hewitt Museum a few weeks before her death. "Ron (MacNeil) has a project that's a map of Boston with a subway map superimposed. He taught the system to make a generalized subway map of the city. If you tell the machine how to do Boston, then it can generate a subway map of Atlanta. You've given the machine an understanding of the problem." Traditional VR is cool, but it's so literal. The workshop's landscape gives you context and continuity. Anyone who has tried to design interactive media knows that the most important thing is to keep the user from getting lost. The workshop's landscape uses abstract elements, it mixes metaphors, and it works! Typography takes on real world characteristics: it blurs, it spins, it grows and shrinks. You fly past a headline and drop into a diagram of a network; zoom closer, and you're in the corridors of a building. The design necessary for this medium is not a noun. It's a verb.

That is just one of Muriel Cooper's legacies.

Wendy Richmond co-founded Design Lab at WGBH TV in Boston.



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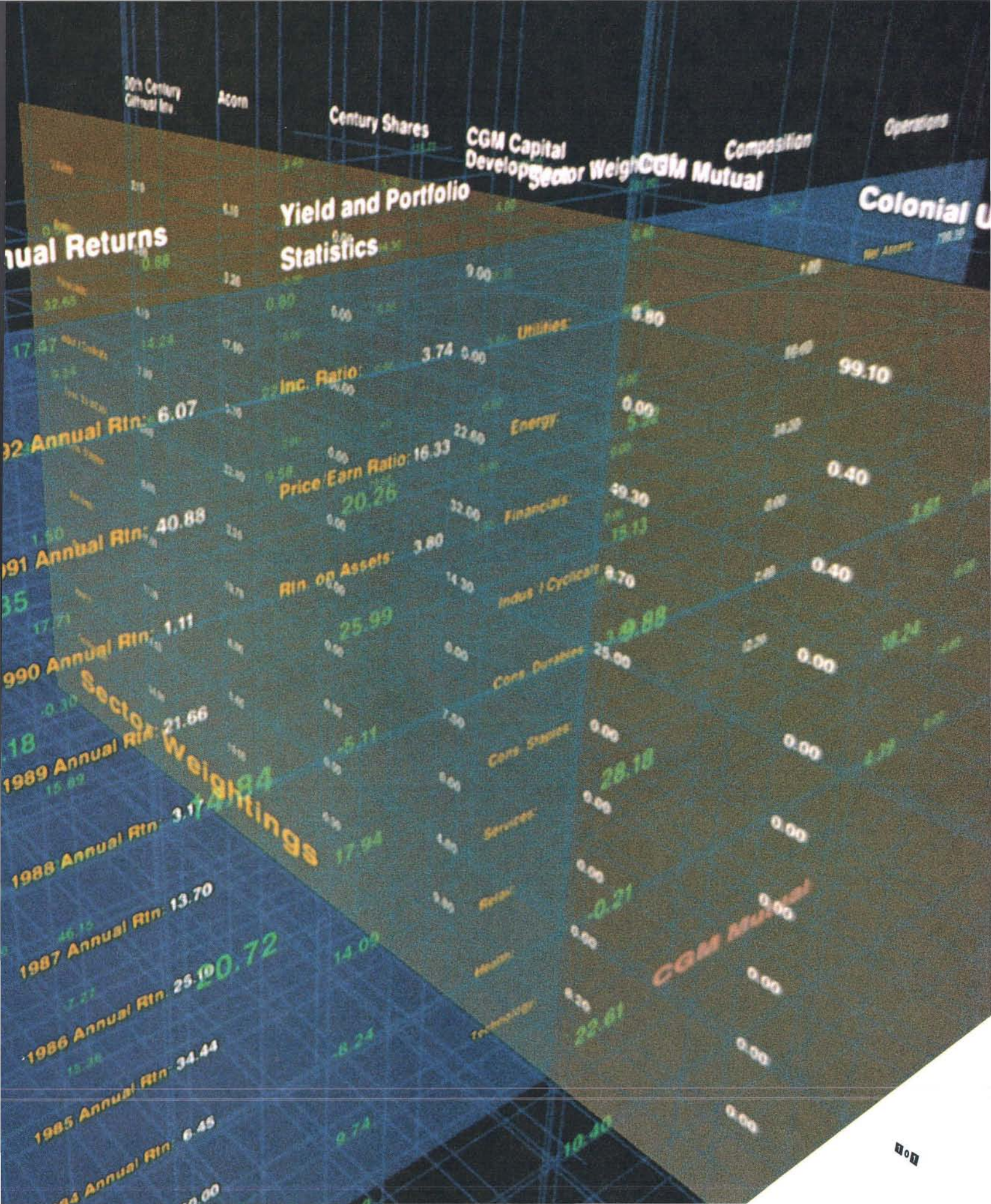
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Utilities: 6.80
Energy: 0.00
Financials: 49.30
Indus / Cyclical: 8.70
Cons. Durables: 25.00
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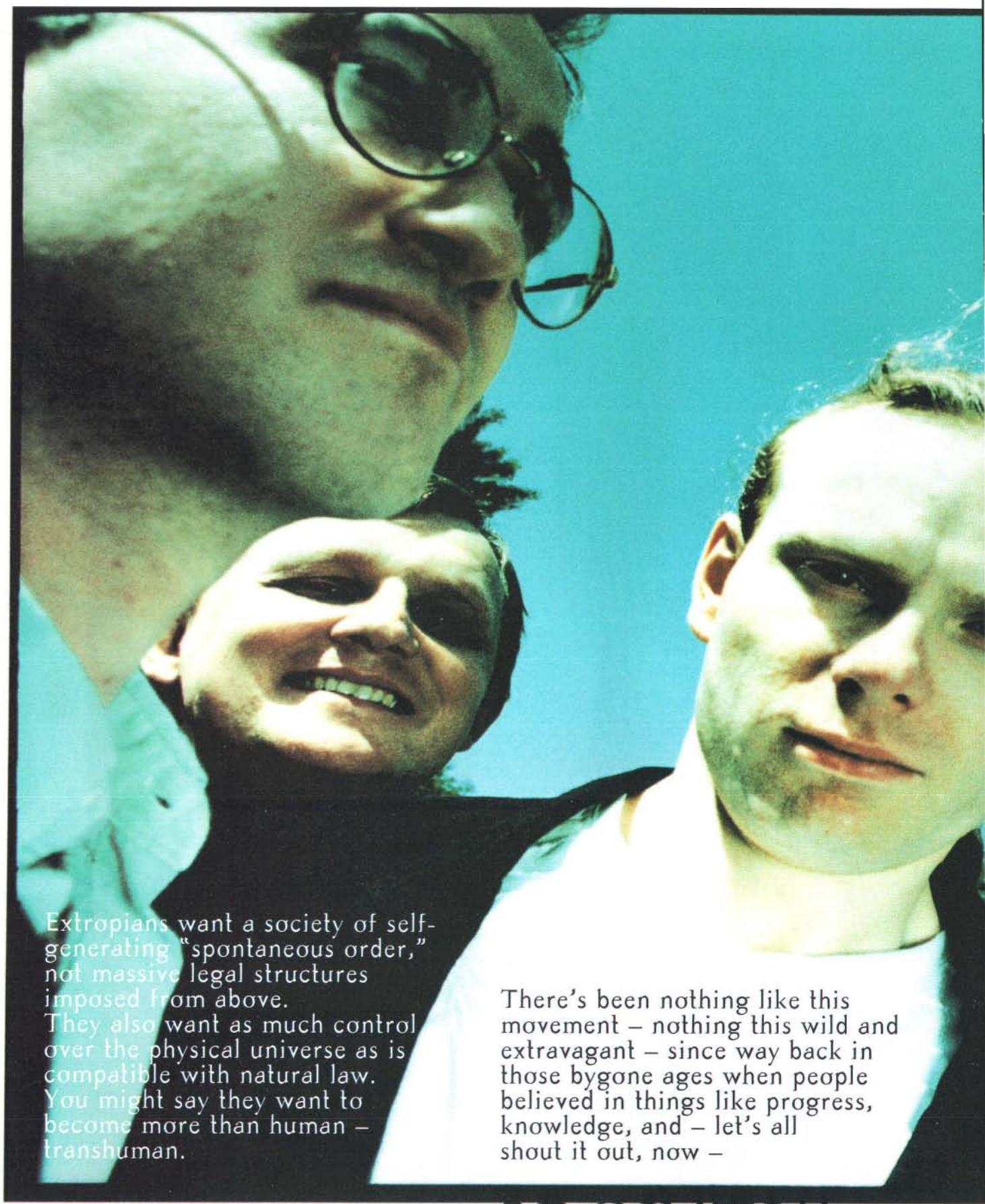

Extropians want a society of self-generating "spontaneous order," not massive legal structures imposed from above.
They also want as much control over the physical universe as is compatible with natural law.
You might say they want to become more than human – transhuman.
There's been nothing like this movement – nothing this wild and extravagant – since way back in those bygone ages when people believed in things like progress, knowledge, and – let's all shout it out, now –
GROWTH!

MEET THE EXTROPIANS

BY ED REGIS

PHOTO: BILL MCLEOD

The Handshake: Right hand out in front of you, fingers spread and pointing at the sky. Grasp the other person's right hand, intertwine fingers, and close. Then shoot both hands upward, straight up, all the way up, letting go at the top, whooping "Yo!" or "Hey!" or some such thing.

You won't be able to do this without smiling, without laughing out loud, in fact – just try it – but this little ceremony, this tiny two-second ritual, pretty much sums up the general Extropian approach. This is a philosophy of boundless expansion, of upward- and outwardness, of fantastic superabundance.

It's a doctrine of self-transformation, of extremely advanced technology, and of dedicated, immovable optimism. Most of all, it's a philosophy of freedom from limitations of any kind. There hasn't been anything like it – nothing this wild and extravagant, no such overweening confidence in the human prospect – since way back to those bygone ages when people still believed in things like progress, knowledge, and – let's all shout it out, now – *Growth!*

Their gung-ho attitude reflects the success of digital technology, which these days allows us to create – at least in cyberspace – anything conceivable. You can create your own simulated universe if you want to. What's more, you can actually get it right this time: you can start at the bottom and remake things as you'd want them to be, as they should have been made in the first place, perhaps. The Extropians take that same attitude and apply it to the real world: they extrapolate out in every dimension, along every parameter, pushing technology to its outermost limits. When you do that, and when you take the results seriously, you find that some pretty outrageous stuff becomes possible.

Just how outrageous became clear at "Extro 1," the first formal gathering of the clan, in Sunnyvale, California, in April 1994, where there were plenty of Extropian handshakes going around – not to mention the hugs and kisses. This is not a doctrine of repressing your feelings, after all, or of being embarrassed about things.

Just a few months previously, at the "Extropaganza" at Mark DeSilets's house in nearby Boulder Creek, the invitations had read: "Bring appropriate toys and gadgets, and a playful attitude. The house has a hot tub, so come prepared; please note that *some* clothing will be required in the tub, so as not to shock the neighbors with the sight of our transhuman physiques!" Romana Machado – aka "Mistress Romana" – software engineer, author, and hot-blooded capitalist, showed up dressed as the State, in a black vinyl bustier and mini, with a chain harness top, custom-made for her at Leather Masters in San Jose, California, for whom she does modeling work. She was in all that garb, carrying a light riding crop, plus a leash, at the other end of which, finally, her Extropian companion Geoff Dale, the Taxpayer, crawled along in mock subjection. The couple embodied Extropian symbolism, the State being regarded as one of the major restrictive forces in the Milky Way galaxy. These people *hate* government, particularly "entropic deathworkers like the Clinton administration."

And so later on, when you threw off your inhibitions, shackles, chains, and clothes, and splashed around in the hot tub together with the VEPs on hand – the Very Extropian Persons – you could actually imagine that, here in the Santa Cruz mountains, the Extropians had discovered the secret of existence. You got a further inkling of what that secret was during Extro 1, which was decidedly more refined a gathering. It was the occasion for theory and reflection, for sober discussion of Extropian ideas. Like immortality, for example.

Early in the conference, Mike Perry, overseer of the 27 frozen people (actually, 17 are frozen heads, only 10 are entire bodies) submerged in liquid nitrogen at minus 321 degrees Fahrenheit *(Cold enough for you?)* at the Alcor Life Extension Foundation, a cryonics outfit in Scottsdale, Arizona, gave a talk saying that, contrary to appearances, genuine immortality was physically possible.

"Immortality is mathematical, not mystical," he said.

Perry, with a PhD in computer science from the University of Colorado, might well think so. A rather gaunt figure, a little rumpled and slightly stooped, he'd worked out a scheme whereby if you make enough backup copies of yourself, then everlasting life can be yours forever, always, and in perpetuity.

He explained: some of the more submissive immortalists – *non-Extropian* immortalists, in other words – had worried about the possibility of their lives being terminated by accident, murder, or some other such form of radical unpleasantness. The way to get around that in the future, said Perry, would be to download the entire contents of your mind into a computer – your memories, knowledge, your whole personality (which is, after all, just *information*) – you'd transfer all of it to a computer, make backup copies, and stockpile those copies all over creation. If at some point later you should happen to suffer a wee interruption of your current life cycle, then one of your many backups would be activated, and, in a miracle of electronic resurrection, you'd pop back into existence again, good as new.

Well, this was a vision entirely agreeable to the audience, some 70 or so Extropic presences now basking in immortalist cheer in the main conference room at the Sunnyvale Sheraton. An infinitely long life span is just one small part of the greater Extropian dream, a package that involves the wholesale transformation of man, culture, and even of nature. The overall goal is to become *more* than human – to become superhuman, "transhuman," or "posthuman," as they like to say – possessed of drastically augmented intellects, memories, and physical powers. The goal is a society based on freely chosen social arrangements, on systems of self-generating "spontaneous order," as opposed to massive legal structures imposed from above by the State. And the goal is to gain as complete control over the physical universe as is compatible with natural law.

An impressive program by any standard. But if the Extropians are right, off in the dim mist is a grand new order of things, one that is not so much physical or political as it is *metaphysical*, founded upon a lavishly expanded conception of human possibility. No longer is biology destiny: with genetic engineering, biology is under human control. And with nanotechnology, smart drugs, and advances in computation and artificial intelligence, so is human psychology. Suddenly technology has given us powers with which we can manipulate not only external reality – the physical world – but also, and much more portentously, *ourselves*. We can become whatever we want to be: that is the core of the Extropian dream.

People have dreamed such dreams before, of course: they've wanted to fly like eagles, to run like the wind, to live forever. They've dreamed of becoming like the gods, of having supernatural powers. The difference is that now, suddenly, all of it is entirely possible. For the first time in history, science and technology have caught up to the wildest of human aspirations and hopes. No ambition, however extravagant, no fantasy, however outlandish, can any longer be dismissed as crazy or impossible. This is the age when you can finally do it all.

The Extropians are the first ones to realize this, the first to make a doctrine and a program out of it, wrap it up into a system, and offer it to the outside world – which is exactly what they were doing at Extro 1. Nobody at the conference was pretending there were no problems involved; this was a highly literate technical bunch: computer scientists, rocket designers, a neurosurgeon, a Berkeley chemist, writers, researchers, and so on. From them could be heard a reservation or two.

Ed Regis (edregis@aol.com) *is the author of* Great Mambo Chicken and the Transhuman Condition: Science Slightly Over the Edge.

PHOTO: BILL MCLEOD

Max More, co-founder of and primary intellectual force behind Extropianism.

"What about copying errors?" asked one of them about the immortality-through-backups scheme.

"Well, you can check one copy against the other," Mike Perry said.

But how about the question of storage medium? Will a physical thing persist that long? Doesn't proton decay put some limits on this? What about the possible ultimate contraction of the universe?

Well ... never mind! Stay your naysaying! We're chasing after big quarry here! Eternal survival! Resurrection after obliteration! Unbounded happiness across infinite time!

Come on! We're *Extropians!*

For all its gonzo metaphysics, the fact is that Extropianism is a carefully worked out philosophical movement, one whose rituals, symbolism, and mind-set are rooted in a deep and rich body of principles. The basic idea is to fight entropy – the natural tendency of things to run down, degenerate, and die out – with its polar opposite, "extropy."

Extropy, according to the official Extropian Principles (version 2.5), is "a measure of intelligence, information, energy, vitality, experience, diversity, opportunity, and capacity for growth." Extropianism, then, is "the philosophy that seeks to increase extropy."

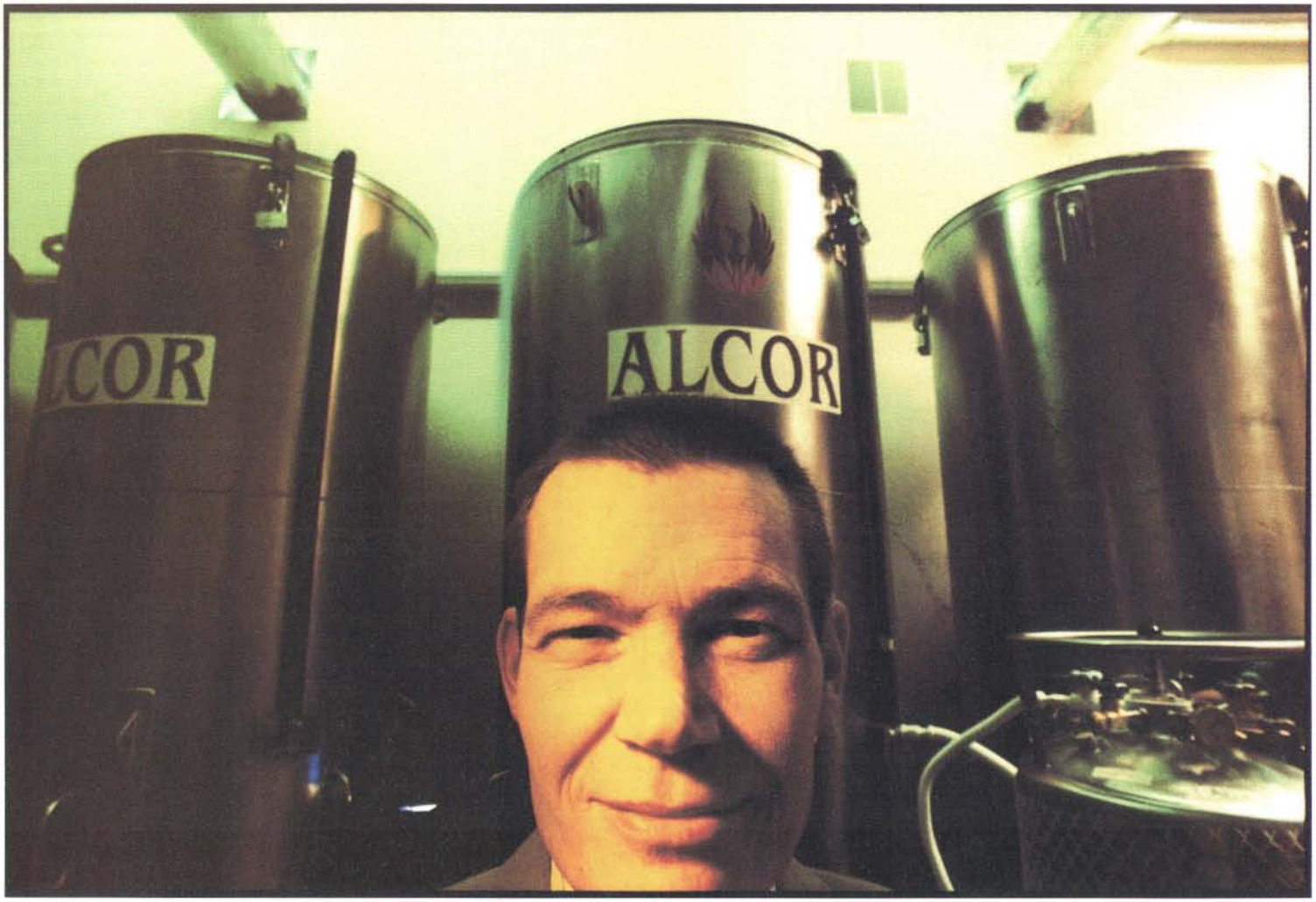
The principles themselves are five in number: Boundless Expansion, Self-Transformation, Dynamic Optimism, Intelligent Technology, and Spontaneous Order. They make up the handy Extropian acronym: BEST DO IT SO!

How well thought-out! How self-referentially interconnected! The five principles, the five fingers of the Extropian handshake, the five arrows on the Extropian logo, curving outward from the center like the points of a pinwheel or the arms of a spiral galaxy!

To the major Extropians, the principles are meant to be taken seriously: they're meant to be *practiced*, they're guides to action, not just a bunch of abstract theories. Take this business of Dynamic Optimism, for example. In 1991 Max More, co-founder of and primary intellectual force behind Extropianism, wrote an essay called "Dynamic Optimism: Epistemological Psychology for Extropians," in which he enumerated eight separate strategies – *eight!* – by which you could acquire a properly auspicious view of yourself, life, and the universe. There was the technique of *selective focus*, for example, whereby you'd concentrate on the positive aspects of a given situation, on what you personally regarded as worthy and valuable. You'd adopt such a focus regularly, systematically; you'd make it a matter of personal policy.

"This need not require a denial of pain, difficulty, or frustration," he wrote. "Rather it may be a matter of spending less time on unpleasantness and of apprehending unpleasant things in a masterful, empowering way instead of a helpless, victimizing way. Optimists attend to the downsides of life only insofar as doing so is likely to enable them to move ahead."

And so on through seven more steps. *Stoicism:* optimists "don't whine and moan about things that are past or out of their control." *Questioning of limits*: "Optimists will question and probe at any



Mike Perry, overseer of 27 frozen folk: contrary to appearances, genuine immortality is physically possible.

entrenched limiting assumptions, especially where these appear to lack a rationally convincing basis. Only an iron-clad demonstration of impossibility (such as Gödel's incompleteness theorem) will stop them; even then optimists will be careful not to draw unnecessarily frustrating conclusions."

The tract was fitted out with the usual scholarly apparatus: footnotes, bibliography, and references to thinkers ranging from the church father Tertullian, circa 200, to contemporaries like Robert Nozick and Ayn Rand.

Imposing as it all was, it was merely Max More's latest attempt to go beyond the limits, something he'd been doing since birth.

"According to my mother I was named Max because I was the heaviest baby in the hospital ward where I was born," he said.

That cataclysmic event occurred in Bristol, England, in 1964. Later, at age 5, Max was transfixed by the moon landing and was fascinated by high technology and the future. He idolized the superheroes of various types that he read about in comic books: he craved their X-ray vision, their disintegrator guns, their ability to walk through walls.

"When I was about 10, I went through a period of real interest in the occult. I was very interested in the idea of any kind of paranormal powers, having abilities beyond the normal human ones."

He even started a club, called Psychic Development and Research, at the school he attended, for the purpose of exploring the nether realms. But the more he actually learned about the occult, the less he was convinced that there was anything to it, and ultimately he became an all-out rationalist. The only reliable way of gaining knowledge, he decided, the only way to accomplish anything worthwhile, was through hard science and cold logic.

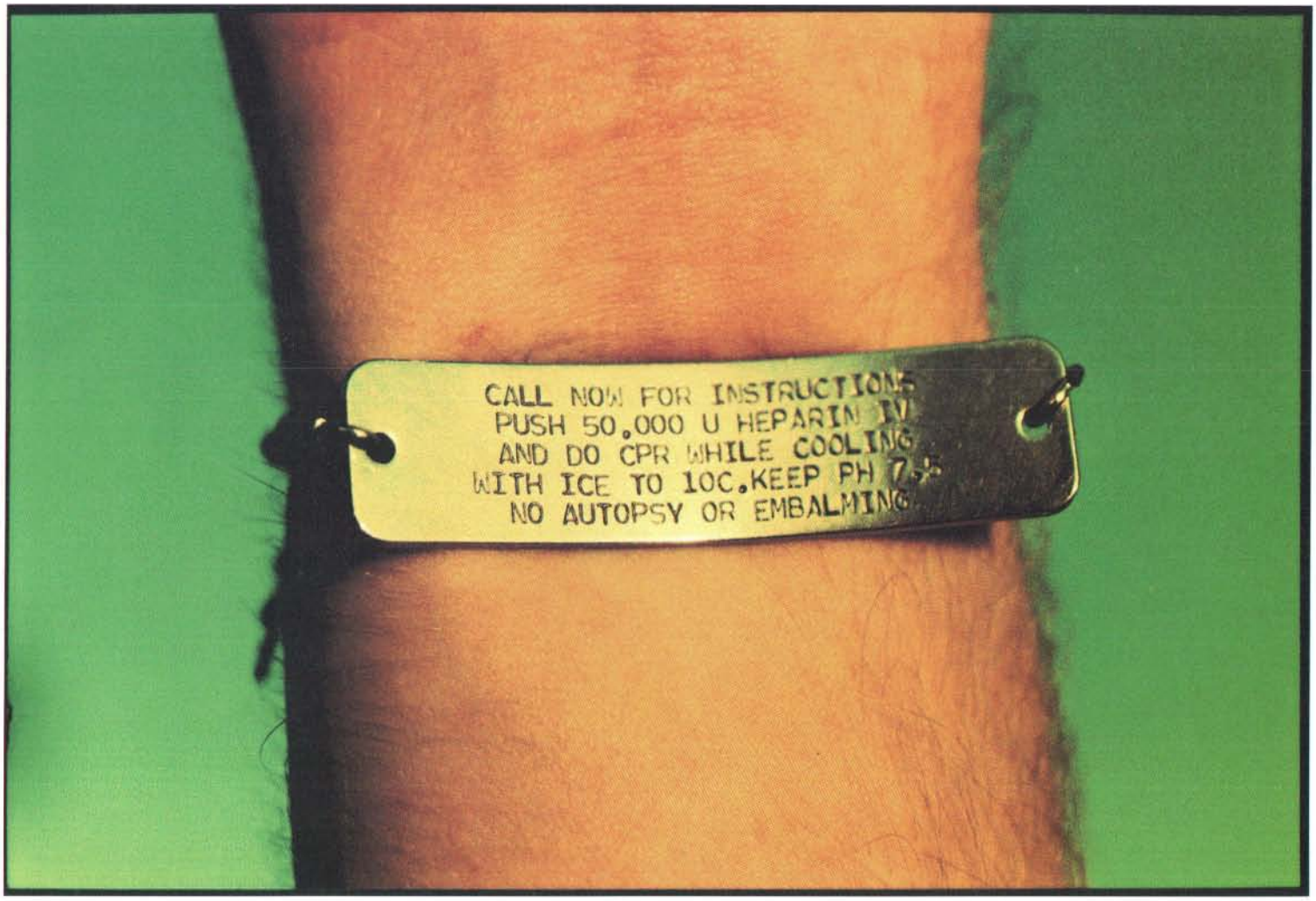
Later on, he attended St. Anne's College, Oxford, where he majored in philosophy, politics, and economics. Always very big on organizing things, he started up new clubs and discussion groups, published magazines, and became, he claims, the first person in Europe to sign up for cryonic suspension – the process of being frozen at death in hopes of later revival. He kept a heart-lung resuscitator in his dorm room, just in case. "People used to go in and see that, and it added to the odd impression, along with my several rows of vitamins on the shelves." Not to mention the 3,000 science fiction books.

He got his degree and, tired of England's dreary mood, lit out for the States.

"Going to Los Angeles was a wonderful thing. It had this glamorous feel to it, it was just a huge thrill being there. I remember going on the freeways and looking up at the sign and seeing Los Angeles and saying, 'I'm really here! Wow!'"

This was the land where everything was possible. Sunshine! Palm trees! California girls! Minor impediments like smog and earthquakes did not figure into his personal equation. But a change of name did.

"In Southern California, everybody changes their name: actors do, writers do. I knew I wanted to be a writer and become known, so that



PHOTOS: BILL MCLEOD

In case mortality rears its ugly head, some Extropians come with handy post-mortem instructions.

I could spread these ideas better, so I thought I might as well change my name," which until then had been Max O'Connor.

He spent a year thinking up a new name for himself, finally deciding on the word, *More*.

"It seemed to really encapsulate the essence of what my goal is: always to improve, never to be static. I was going to get better at everything, become smarter, fitter, and healthier. It would be a constant reminder to keep moving forward."

It would also be the start of a trend among Extropians: Mark Potts became Mark Plus; Harry Shapiro became Harry Hawk.

"It's a great expression of self-transformation," said Tom Morrow, a Silicon Valley attorney, about renaming himself. "This is how I'm changing myself: I'm going to change the way people think of me – because people think of you, in part, by the way you're named. Also we pick descriptive names, which is a trait the Quakers also shared; they often named their kids with descriptive names like Felicity or Charity. You see that same trait in Extropians. They hold their values so dear, they want to be associated with them more than by just holding them. They want to be *known* by them.

"And also," he added, "it's a fun sort of thing."

Fun, indeed, would be the sixth Extropian principle, if there were one. It was Tom Morrow, at any rate, who began using the term "Extropy," invented the Extropian handshake, and, together with Max More, co-founded Extropianism, back when both of them were graduate students in philosophy at the University of Southern California.

By the time Morrow and More were getting their master's degrees in the subject, the ideas of souped-up humans that had been percolating through Max's head since childhood had been reinforced by certain doctrines of the Western philosophers, some of whom had advanced like-minded, or at least highly sympathetic, notions. Aristotle, who'd founded logic as a formal discipline and had done pioneering research in biology, professed an ethics of self-realization, the notion of fulfilling one's highest potential. There were the philosophers of the Enlightenment, the Age of Reason, thinkers like Voltaire, John Locke, and Adam Smith, who claimed that genuine knowledge was in fact possible, that nature was knowable, and that progress was desirable and good. There was Ayn Rand, who put forward the conception of "man as a heroic being," able to perform untold feats of imagination and creation. And above all there was Friedrich Nietzsche, the 19th century philosopher who explicitly advocated mankind's transforming itself into something far superior.

"All beings so far have created something beyond themselves," wrote Nietzsche. "Do you want to be the ebb of this great flood and even go back to the beasts rather than overcome man?"

There was much that needed to be overcome, that was for sure. Human beings had almost too many flaws, chief among them being the unholy trio of sickness, aging, and death. Beyond that there were vast surfeits of human evil: wanton excesses of fraud and deceit,

mindless violence, prejudice, police states, and so on and so forth. It did not make for a pretty picture, especially considering that all of it was rectifiable, totally reversible through human action.

"I teach you the overman," Nietzsche had said. "Man is something that shall be overcome. What have you done to overcome him?"

What Max More and Tom Morrow did in 1988 was to start up the journal *Extropy*. By challenging culturally entrenched notions about the inherent limitations of humankind, they'd show how the species could pull itself out of the mud. Sickness could be wiped out, aging reversed, life spans lengthened, intelligence increased, states replaced by voluntary societies – and all of this in the first issue! The print run was just 50 copies, but even so it was hard to get rid of them.

"We basically forced them on people," said More. "Anybody who might be interested, anybody who was our friend, we tried to get them to take a copy. *Go on, just read this!*"

Which they did. It was pretty far-out, this stuff – audacious, but strangely stirring in its own way. One issue proposed "a new dating system" to replace the Christian calendar. Why should Extropians – mostly atheists and agnostics – be forced to use a dating scheme based on the birth of Christ? Why not start from Francis Bacon's *Novum Organum*, the book that in 1620 set forth the modern scientific method, in which case 1990 would be 370 PNO (post *Novum Organum*)? Or start from Newton's *Principia*, maybe. Something *reasonable*.

Along the way there was an attempt to create a nomenclature that lived up to Extropian doctrine. And why not? This was a total philosophy, and so it deserved its own proprietary rhetoric. Soon a whole panoply of extropically flavored neologisms had sprung into existence: *Extropia* (coined by Tom Morrow), a community embodying Extropian values; *Extropolis* (from Max More), an Extropian city located in space; *extropiate* (from Dave Krieger), any drug having extropic effects. There was *smart-faced* (from Russell Whitaker), "the condition resulting from social-use extropiates: 'Let's get smart-faced!'" And there was the instantly-memorable *disasturbation* (another Dave Krieger invention), "idly fantasizing about possible catastrophes (ecological collapse, full-blown totalitarianism) without considering their likelihood or considering their possible solutions/preventions."

Further along there was a concerted attempt to flesh out the Extropian dream. Tom Morrow, the Extropian legal theorist, wrote articles about "privately produced law," showing how systems of rules can and do arise spontaneously from voluntary transactions among free agents, without the assistance of Mother Government. He also wrote about "Free Oceana," a proposed community of Extropians living on artificial islands floating around on the high seas.

Still, all of that was mere theory. Back in the real world, Morrow and More established a sort of intergalactic headquarters for Extropians, the Extropy Institute, a nonprofit California corporation. Soon there was also a bimonthly institute newsletter, the *Exponent*, as well as an electronic mailing list. And in a short time, Extropianism seemed to have acquired all the trappings of a major cultural phenomenon, with a succession of parties, weekly lunches, T-shirts ("Forward! Upward! Outward!"), and even an Extropian "nerd house," called Nextropia, in Cupertino.

Operated by Romana Machado, the aforementioned "Mistress Romana" who in real life works in the Newton division of Apple Computer (she's also the inventor of Stego, a program that compliments traditional encryption schemes – see "Security Through Obscurity," *Wired* 2.03, page 29), Nextropia is an Extropian boarding house, a community of friends. Just don't call it a "commune."

"The very term makes us shudder," said Max More, who doesn't even live there. "It implies common ownership. 149 ►

Act Like Nothing's Wrong

Symbolic. Ironic. Gross. Funny. All these describe the cannibalistic artwork of Winston Smith. For the past 18 years, Smith has been creating collage art from the thousands of magazine images that fill his tiny San Francisco apartment.

Using Uhu gluesticks and an Olfa stainless steel razor blade, Smith harvests photographs from old magazines, combining them into works that target the "nothing's wrong" attitude, as he calls it, prevalent in today's media.

When Smith returned to the US after six years in Italy, two of them at the Academy of Fine Arts in Florence, he was struck by the level of corporate control endured by most Americans. His work is an uncomfortable reminder that things are not as pleasant as they may seem.

Smith uses images from the mass media, twisting them into the Frankenstein children of Madison Avenue. In pieces like one in which a farmer unloads a pile of babies with a pitchfork (the caption reads,"Well, it's a job, and a man's gotta eat"), Smith challenges those who would never "knowingly" hurt anyone yet are willing to work in industries that create weapons of destruction.

"My work is on a scale that people can relate to," he says. We may not see the government spending billions of tax dollars on "Batman planes that can't shoot straight," but we can't ignore the message in Smith's image of a hundred slaves toiling to pull a nuclear submarine up a rocky hill.

Icons of sex, money, and violence are everywhere in his art. "I work with what I have," Smith says. "That's what *Time* gave me." – *Andrew Rozmiarek*

Act Like Nothing's Wrong, a collection of Smith's works, is available from Last Gasp, US$24.95.

How About a Little Bang?

By Michael Gruber

NEUROBOTICS

The future of computing may be gestating, not in computer labs, but in an obscure discipline called process control, where scientists have discovered that **a little smear of rat brain** can solve one of the big problems in chemical engineering.

Despite the enormous progress made in the electronic digital computer, the box on your desk – or on your lap, or in your pocket – is the same sort of machine as the 50-year-old room-sized monster. It manipulates binary code the way it has been programmed to do. Computers of this type will become faster and more powerful for a time, but there are already signs they are approaching limits in both hardware and software. Even without these limits, digital computers of any conceivable power will have difficulty accomplishing seemingly simple tasks. A big machine capable of running a space mission fails completely when asked to pick a face from a crowd or to drive a robot across a room full of obstacles. These sorts of problems have already been solved in nature, in an infinite variety of ways, by the associations of neurons directing living creatures. The next big jump in computing, potentially as important as the jump that created the programmable electronic computer, must be inspired by biology.

If the past is any guide, this will probably not occur in the likely places – the major hardware or software companies. The original electronic computer was hatched not by the big electronic firms of the time nor by the banking or insurance businesses that first profited from its development, but in an obscure corner of the military-industrial complex, by a group with lots of money and an urgent need to solve artillery trajectories. It may be that the successor to that type of machine is gestating far from the hotbeds of computerdom, in an obscure corner of the chemical business: a field called process control.

A modern chemical plant is among the most complex of structures, involving acres of pipes, tanks, reactor vessels, distillation columns, valves, and compressors. In this it compares to other complex artifacts, such as telecom nets, computers, and power grids. The difference is that these others are susceptible to what systems people call linear control: turn the volume knob on your stereo, and you go smoothly from barely audible to ear-splitting. Electronics is like that, and though there are nonlinearities in electronics, engineers are clever enough to compensate for them and render them nearly worthless. But at the heart of every chemical plant are reactor vessels and distillation columns; reactions take place there that are nowhere near linear. Not only are chemical reactions nonlinear, but they are dynamically nonlinear: changes in heat and pressure have hard-to-control effects on outputs of usable stuff; plus, each batch has a kind of memory.

Most of us have had domestic experience with such reactions. Consider the omelet. You start with an inedible mix of protein and fat. You add heat and air to this mix in precise amounts. At a certain moment the last increment of heat and air, indistinguishable from those that have proceeded it, produces a perfect omelet. That's nonlinearity. The dynamism is seen in the omelet's memory. If you let it go beyond the perfect point, there's no way to bring it back to perfection by, say, cooling it. You have to throw it away and start over. Although chemical engineering has been a science for a century or so now, it is still a lot more like cooking omelets than the people who run chemical companies would like. As in a kitchen, yum can turn to yuck in an instant, and the difference between the two makes up a large part of the bottom line. This is where process control comes in.

There is another difference that chemical people don't talk about much. When something goes sour on a telecom net or a power grid, people get pissed off and can lose significant amounts of money. When a chemical plant goes sour, you get The Fireball: large pieces of white-hot metal go flying everywhere at high speeds, and you can lose a hundred-million-dollar investment in four seconds. That's if you're lucky. If you're unlucky, you get Bhopal.

Chemical companies compensate for these characteristics in the same way chefs do – by carefully watching the pot, using a technology that could be described as A Lot of Old People Who Know How to Make Teflon Without Wiping Out Wilmington. This is expensive, and wasteful, and often leaky. Meanwhile, big chemical concerns are under increasing economic pressure, stemming from shrinking profit margins on standard chemicals, from the need to make more of their income from ever more complex processes, from the expiration of their patents, and from environmental demands to reduce leaks and waste products. This has set the stage for a new look at process control.

Although the genesis of technical breakthroughs is hard to determine, it is possible this one

Michael Gruber (mag@well.com), *a former biologist and former civil servant, writes in Seattle using someone else's name.*

ERIK ADIGARD

started a decade or so ago, when a young Nigerian graduate student named Babatunde Ogunnaike was completing his PhD at the University of Wisconsin. A revolution was underway in neurophysiology, and it occurred to Ogunnaike that neuronal systems were adept at controlling the same sorts of nonlinear processes that troubled chemical engineers. Each person is a vat of hundreds of thousands of nonlinear reactions – so is each moth and each hamster.

Of course, the general idea of using biological models in engineering is not particularly new. Biomimetics, as it is known, has been around for years without producing much technology of value besides Velcro. The idea of trying to reverse-engineer neural systems has also been around for a while, particularly at the California Institute of Technology, where Carver Mead and John Hopfield started the line of research that led to the current interest in neural nets. Mead was trying to re-create important sensory neurosystems, like the retina, in silicon.

They would take a rat, wire it for blood-pressure and heart-rate tracking, and insert recording and stimulating electrodes at various sites of interest in the baroreflex system. Ultimately, they could play the system like a videogame.

This sort of thing is a long way from the intense practicality of chemical engineering, and when Ogunnaike asked his advisors about using models derived from neurons for controlling processes in chemical engineering, they all told him to forget it. But he added a speculative section on the potential of biologically based process controls to his statement of research interests anyway and kept it in mind as he moved on in his career. In the mid-'80s, Ogunnaike landed a process-control job at DuPont, in Wilmington, Delaware, and was faintly surprised to learn that DuPont had recently instituted a major life sciences program, including a neurosciences section. DuPont had made a massive investment in life sciences in the hope that somehow the biologists would come up with another nylon – a patentable product that was cheap and easy to make with potentially astronomical profits, something that had eluded conventional chemistry for 40 years.

Running the neuro section was an unconventional former psychologist named Jim Schwaber. Schwaber had come to DuPont from academia as part of DuPont's life-sciences recruiting drive. Having started out as a pigeon-training Skinnerian behaviorist, he then became interested in neurophysiology at the University of Miami, where researchers were studying how animals control their heart rates. Here Schwaber stepped into one of the classic conundrums of behavioral science: if you want to study behavior, you have to understand the brain; if you want to understand the brain, you have to understand its components; if you want to understand its components, you have to understand neurons; if you want to understand neurons, you have to understand membrane physiology and the biochemistry of neurotransmitters; and so on, down to the last increment of reductionism – quarks, maybe. By then, however, you will not be in much of a position to understand why the rat does one thing and not another.

In practice, of course, scientists choose a workable section of study along this continuum and specialize. As it turned out, the one Schwaber chose is right in what might be called the middle of the complex-behavior-to-molecule continuum: a discrete group of about a hundred neurons and their associated sensors and connections that, in concert, mediate the blood pressure of mammals. Simply put, this baroreflex controls blood pressure within a fairly narrow range across a wide range of heart rates.

Whether the rat (or human) is looking for food, fighting for its life, or sacking out; whether the heart is running at max or just ticking over – the blood pressure delivered to the body's cells is pretty much the same. This is not a simple achievement, considering that the system has only two variables: cardiac output and arterial-wall tension. In essence, the system picks up pressure information from receptors in the aortic arch and the cardiac sinuses and sends this information to second-order neurons in the nucleus tractus solitarii (the NTS) up in the brain stem. This information is integrated with other sensory signals that reflect demands on cardiac and respiratory performance, and then the NTS sends control signals to the heart that regulate its rate, rhythm, and force of contraction, while it sends other signals to vascular beds that regulate flow and resistance. The baroreflex is complicated enough to be interesting – it is, after all, a part of the brain – but simple enough to be, at least potentially, comprehensible in detail within a reasonable time, unlike vastly more problematic functions like vision or consciousness.

At DuPont, Schwaber initially set up shop in Central Research and then spent some time in the Imaging Systems Department, because the company thought that the work would have some applicability in biomedical technology. It did, but the more important result was that Schwaber and his group developed the ability to computer-analyze the input, output, and computational functions of the neurons that comprised the baroreflex in real time. They would take a rat, wire it for blood-pressure and heart-rate tracking, and insert recording and stimulating electrodes at various sites of interest in the baroreflex system. Ultimately, they could play the system like a videogame and watch what was happening on a workstation monitor.

When Ogunnaike found Schwaber's lab, he immediately understood that the revolution in process control he had dimly perceived as a grad student was within reach. He saw in the operation of the baroreflex an uncanny similarity to a key problem in

process control. It seems that when you want to make a complex polymer, like Kevlar or Teflon, you boil a soup of the monomer building blocks in a big tank with the appropriate catalysts, and if the temperature and pressure are right, you get the desired product. To control temperature, you use a water jacket around the tank; to control pressure, you jet nitrogen directly into the tank itself. And, of course, there is the direct effect temperature has on pressure, as in a steam engine. To keep pressure within bounds, it's best to use the water jacket, but this response is sluggish, so when pressure starts to drop below the desired set-point, control engineers have to use the nitrogen. Unfortunately, if you jerk the pressure around too much in this way you can ruin the product or reduce the yields. Also, such relatively crude manipulations, when applied to nonlinear systems, produce unpredictable feedbacks that can send the tank completely out of control.

What you really want is a control system that flawlessly integrates slow- and rapid-acting controls with great sensitivity to the nonlinear reactions going on in your vessel. You want a control system that follows a reaction, keeping the important variables within their desired set-points, without the jerkiness that causes feedback. This is what Ogunnaike saw in the baroreflex: a flawless integration of slow-acting (arterial contraction) and rapid-acting (cardiac output) control mechanisms and a near-perfect following controller. A little smear of jelly from a rat's brain was, in effect, solving one of the big problems of chemical engineering.

It did not take long for the enthusiastic Ogunnaike to convince Schwaber to change the orientation of his neuro work from the speculative periphery to the critical center of the chemical engineering world.

In the ensuing years, sharp young process-control engineers were brought in as post-docs, and, probably for the first time anywhere, people who understood meat computing were working closely with those who understood the wire version, in an environment focused on the control of important industrial processes. "In general, computer people don't know how to talk to brain people," Schwaber says. "There's an absent middle ground. The computer people try to make neurons into simple switches – which, of course, they're not – and the brain people sort of throw up their hands and say you can't really get anything useful in analytic terms out of the brain because it's far too intricate and complex. But we're doing it."

The team analyzed the baroreflex in process-control terms, and one of the post-docs, Frank Doyle, now at Purdue University, modeled the baroreflex in a computer and then modeled a common sort of chemical engineering process in the same computer. The biologically based virtual controller was vastly superior to standard controllers in following nonlinear reactions and keeping them within specs.

The next step, obviously, is to go physical. Schwaber and Ogunnaike are somewhat hesitant to discuss exactly when this will happen. (Big chemical firms are so secretive, they make computer companies look like Hollywood gossip columnists.) But it should be soon. One problem appears to be political: convincing the hard-hat types that this really will work, that you can cook chemicals without the Old People. (Oh, you want to run my 30-meter-high potential bomb with an electronic rat-brain fragment? Yeah, sure.)

Meanwhile, Ogunnaike and Schwaber have seen the future, and (so far) it works. Up until now, the neuronal computations have been modeled digitally, but it turns out that if you run a specially designed VSLI chip at voltages lower than those that produce the standard on-off response, you get a suite of responses that can be tweaked to mimic more closely what an assemblage of neurons actually does. Schwaber has already worked with one of Carver Mead's former students, John Lazzaro, to build an analog VSLI chip that mimics the baroreflex. Ogunnaike thinks that analog will ultimately be the hot area for advances in neurobotics.

Obviously, in an area this new, in a departure so radical from the main line of digital computer development, it would be easy to go nuts with speculation. It is, however, reasonable to project that, if the work with the baroreflex (a very primitive brain function) succeeds and big money starts to flow toward neurobotics (and remember that the chemical industry, with big oil included, is about five times the size of the whole computer industry, hardware and software combined), scientists could start to walk up the brain stem, analyzing and rendering in silicon ever more complex brain functions. It may be that artificial intelligence will be developed the same way that nature developed the real thing – through evolution, layer upon layer, from the simple to the complex.

Such computers will not be much like human-programmed digital computers. They will be able to do things that digital machines cannot do easily, or cannot do at all, just as digital computers can do things that organic brains can't pull off. Such computers will not be free-standing boxes, at least at first, but will be tied into technology, giving to industrial processes the sort of homeostatic control exhibited by living beings. They will be less like the idiots that digital boxes are now, utterly dependent on flawless programming, and more like dogs: trainable, but with an inherent set of instincts and abilities, herding our processes and reactions and systems like a border collie runs a flock of sheep. ■ ■ ■

If you run a specially designed VSLI chip at voltages lower than those that produce the standard on-off response, you get a suite of responses that can be tweaked to mimic more closely what an assemblage of neurons actually does.

Mr. Big Trend

Interview by
Kevin Kelly

Futurist
John Naisbitt on why small is not only beautiful, but powerful.

Wired: The subtitle of your new book, *The Bigger the World Economy, the More Powerful Its Smallest Players*, seems to summarize your message. What would you add to that?

John Naisbitt: The subtitle is a formulation of how telecommunications is creating one single global economy, but at the same time empowering individuals and small groups by providing them opportunities that only big companies had before. For instance, my own company, Megatrends Ltd., comprises only four people, including me. But we are involved in 57 joint ventures in 42 countries. Many small players are global forces today. This could never be done before.

That echoes *Megatrends*, in which you pinpointed the movements "from centralization to decentralization," and "from either/or to multiple options." So, what's *new*?

It's being played out, and it's being accelerated, and it's being assimilated.

If an increasing number of smaller players are entering the global field, what about these billion-dollar media mergers that seem to be getting bigger and bigger?

Sometimes it's just dinosaurs mating. But sometimes it's necessary infrastructure. Again, it's not either/or. For example, you can't make 747s in your garage. Small is powerful – and small is getting more powerful – but *appropriate scale* is what is beautiful.

Do you think that there's going to be a different kind of bigness?

I hadn't thought of it quite that way, but yes, where we have bigness, it's going to be a different kind of bigness!

You predict that in 50 years there will be 1,000 countries in the world. What's your evidence?

In the 1992 Olympics in Barcelona, 172 countries competed. More than 200 teams are expected in 1996. And in the magical year 2000 there'll probably be more than 300 countries represented. As the world becomes more universal, it also becomes more tribal. As people yield economic sovereignty and become economically interdependent, holding on to what distinguishes you from others becomes very important.

It sounds as if we are headed toward a patchwork world where people will have multiple allegiances. They'll have an allegiance to a tribal identity, an allegiance to an economic identity, an allegiance to a political boundary identity. These may be overlapping or contradictory.

If you're a Muslim in Bosnia, you are overwhelmingly a Muslim. But as the world opens up, you can be all kinds of things. You can be a Houstonian and a Texan and an American and an accountant and Chinese, all at the same time.

In this new environment, what is the basic unit? The individual? The family? The tribe?

Without question, in unthreatened environments, the individual is the basic unit. This is a triumph and a new celebration of the individual. Some things will be universal, partly because everybody's experiencing everybody else. And some things will differentiate this tribe from that tribe. The riddle of the 1990s is, what's going to become universal, and what's going to remain tribal?

Couldn't this great new epoch of individuality, rather than leading to world harmony, lead to global anarchy? There's a downside to mass democratization and individualization: you can get a big mob.

That's an élitist perception. I'm more Jeffersonian on this: If you can't trust the people, who can you trust?

So you are an optimist?

I've noticed there's at least a small market for being optimistic. [Chuckles.] There's going to be *more* optimism – as people get linked up all over the world and feel they're running their own lives. That will lead to more optimism.

You foresee a boom in global travel. People are mobile, borders are open. But if you combine this global mobility with increasing tribalism – and increasing awareness of injustice facilitated by global communications – then you have a wonderful recipe for global terrorism. Is this an unreasonable fear?

Oh, it's a reasonable fear. It's even *worse* than that. In the sense that a terrorist act is a statement, it must compete with more and more noise in the world. So like advertising, terrorism will have to be more and more outrageous.

***Global Paradox* contains a nice little summary of prospects for different regions in the near future: Europe falling into a deep recession, Japan's economy being flat, and North America experiencing modest to stronger growth. And you predicted booms in Asia and Latin America. What about Russia?**

I think that Russia will eventually split up into as many as 40 or 50 countries; but in the meantime, it's a terrible mess. The only market that works in Russia is the black market. I think a perfectly respectable strategy would be to let the black market take over everything.

What does government look like 100 years from now? Does everybody vote for everything? Or are there good reasons to continue group representatives?

I think the next step beyond representative democracy is direct democracy. Why didn't we all get to vote on NAFTA? It impacted on all of our lives. Why didn't we all vote on the supercollider in Texas?

Well, I really want to believe that, but the problem is, I just don't have time to vote responsibly on everything. Anyway, who decides what things we vote for? That turns out to be the same problem: who frames the question?

The question is, are we going to find out? No one is stopping us from trying it.

Let's say God decided to punish you and appoint you the president of some country. What would you do?

I would nourish the entrepreneurs. We forget how easy it is to start a business in the US. You can start one overnight. Most countries are hostile to entrepreneurs.

You claim to be a student of the present. What would be your advice to a high school student?

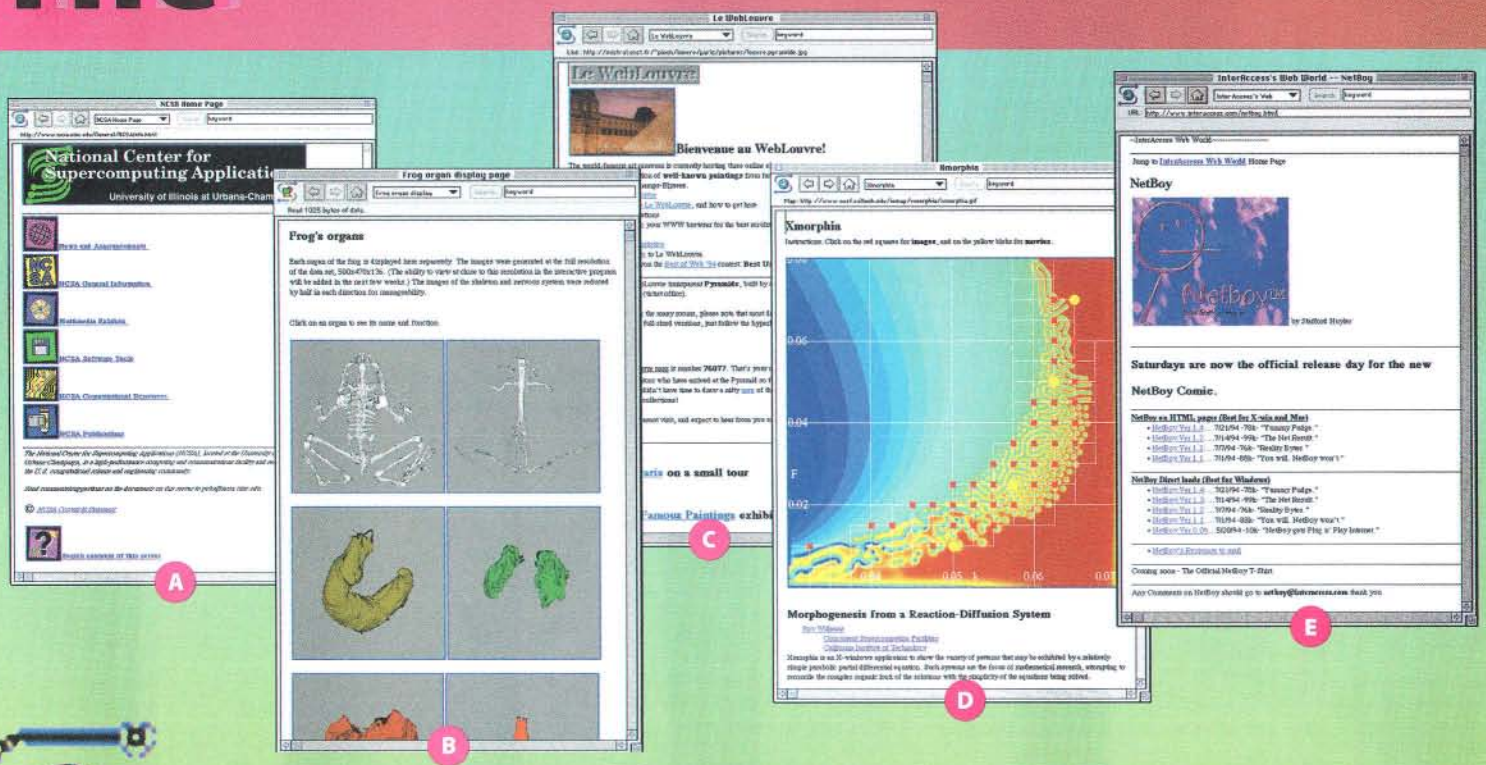
It's an old-fashioned idea, but the most important thing to do is to learn how to learn. That's the great thing about journalism, which I trained in. We don't know a thing about something, but we know how to find out everything about it. In fact, that was Henry Luce's idea with *Time* magazine – to have great journalists who knew how to learn. ■ ■ ■

John Naisbitt hit the publishing jackpot in 1982 with his surprise bestseller *Megatrends*, about the future shape of the technological world. Naisbitt predicted that 10 shifts would dominate coming decades. One of his mantras, "High-Tech/High-Touch," thoroughly entered the public consciousness and continues to be a rule of thumb: every technological force spawns a parallel but opposite anti-tech force. Mr. Big Trend followed *Megatrends* with consulting, speaking, and, in 1986, *Re-inventing the Corporation*, which he coauthored. Now he's back, with his latest shape-shifter, *Global Paradox: The Bigger the World Economy, the More Powerful Its Smallest Players*.

PHOTO: BILL MCLEOD

Don't look now, but Prodigy, AOL, and CompuServe are all suddenly obsolete – and Mosaic is well on its way to becoming the world's standard interface

The (Second Phase of the)



When it comes to smashing a paradigm, pleasure is not the most important thing. It is the *only* thing.

If this sounds wrong, consider Mosaic. Mosaic is the celebrated graphical "browser" that allows users to travel through the world of electronic information using a point-and-click interface. Mosaic's charming appearance encourages users to load their own documents onto the Net, including color photos, sound bites, video clips, and hypertext "links" to other documents. By following the links – click, and the linked document appears – you can travel through the online world along paths of whim and intuition.

Mosaic is not the most direct way to find online information. Nor is it the most powerful. It is merely the most *pleasurable* way, and in the 18 months since it was released, Mosaic has incited a rush of excitement and commercial energy unprecedented in the history of the Net.

Intense efforts to enhance Mosaic and similar browsers are underway at research institutes around the world. At least six companies are gearing up to sell commercial versions of Mosaic. In April 1994, Jim Clark, founder of Silicon Graphics Inc., helped spur the frenzy, creating the Mosaic Communications Corporation and hiring a half dozen of the most experienced Mosaic developers away from the National Center for Supercomputing Applications (NCSA), where Mosaic was born (see "Why I Dig Mosaic," page 120). Two months later, Digital Equipment Corporation announced plans to ship a version of Mosaic (enhanced by Spyglass Inc.) with every machine it sells. Rumors have circulated that Microsoft was secretly licensing Mosaic to incorporate it into Windows. (Microsoft says only that it is "considering" a Mosaic license.) Jim Clark's partner at Mosaic Communications, a 23-year-old University of Illinois graduate named Marc Andreessen, will tell you with a straight face that he expects Mosaic Communications's Mosaic to become the world's standard interface to electronic information.

Long-frustrated dreams of computer liberation – of a universal library, of instantaneous self-publishing, of electronic documents smart enough to answer a reader's questions – are taking advantage of Mosaic to batter once more at the gates of popular consciousness. This time, it looks like they might break through. Mosaic is clumsy but extraordinarily fun. With Mosaic, the online world appears to be a vast, interconnected universe of information. You can enter at any point and begin to wander; no Internet addresses or keyboard commands are necessary. The complex methods of extracting information from the Net are hidden from sight. Almost every person who uses it feels the impulse to add some content of his or her own. Since Mosaic first appeared, according to the NCSA, Net traffic devoted to hypermedia browsing has increased ten-thousandfold.

Looks Count

Ironically, the ingenious network that you see with Mosaic has been around for several

Gary Wolf reports on everything you ever wanted to know about Mosaic.

to electronic information.

Revolution Has Begun

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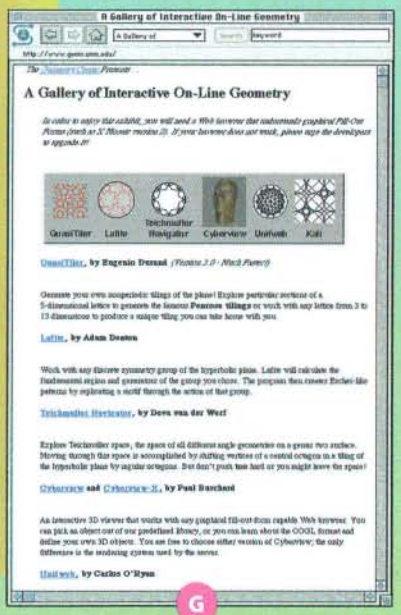
In January 1993, Marc Andreessen (left) released the first version of the NCSA's Mosaic browser. By year's end, browsers were being downloaded at an average rate of more than a thousand per day. By mid-1994, active Web pages (like those shown here) grew from 50 to more than 1,500.



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ALL PHOTOS BY BILL ZEMANEK

years. It is called the World Wide Web, and it was developed by a group of programmers at the European Particle Physics Laboratory (more commonly known by its old French acronym, CERN, for Conseil Européen pour la Recherche Nucléaire) led by Oxford graduate Tim Berners-Lee. Berners-Lee and his colleagues faced the problem of creating a unified hypertext network for high-energy physicists working in a diverse international environment. They came up with a stunning solution. Rather than attempt to impose standards on the hardware or software, they defined standards for the data. They also created a universal addressing system. Using a relatively simple set of commands, World Wide Web users can turn their documents into hypertext: insert the proper bit of code, and a word becomes a link; insert a different bit of code, and a sentence becomes a headline or begins a new paragraph. With the new addressing system, nearly any Net document – text, picture, sound, or video – can be retrieved and viewed on the World Wide Web.

The beauty of this approach is that it allows maximum openness and flexibility. All World Wide Web documents are similar, but every World Wide Web reader, or browser, can be different. From the smallest laptop to the most outrageous supercomputer, nearly every machine can hook into the Web. The Web, despite its sophisticated hypertext capabilities, is as catholic as the Net itself. All you need for exploring is a browser.

This, of course, is where Mosaic comes in. The first World Wide Web documents and browsers were functional but off-putting. They were not point-and-click. They did not have colors or images. But the Web was free, and as Tim Berners-Lee and other Web developers enriched the standard for structuring data, programmers around the world began to enrich the browsers. One of these programmers was Marc Andreessen, who was working for the NCSA in Urbana-Champaign, Illinois. In January 1993, Andreessen released a version of his new, handsome, point-and-click graphical browser for the Web, designed to run on Unix machines. In August, Andreessen and his co-workers at the center released free versions for Macintosh and Windows. In December, a long story about the Web and Mosaic appeared in *The New York Times*. And by the year's end, browsers were being downloaded from the NCSA at an average rate of more than a thousand per day.

Some programmers active in the World Wide Web community resent all the attention Mosaic has received. They know that the real heart of the World Wide Web is the data standard and the addressing system. They argue that any bozo – or at least any sufficiently talented bozo – can write a browser. "A guy on our project wrote a browser in a week," says one unimpressed programmer at the Massachusetts Institute of Technology, whose name I withhold out of

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Gary Wolf (gwolf@igc.apc.org) *writes regularly for* Wired. *He and Michael Stein are the authors of* Aether Madness: An Off-Beat Guide to the Online World *(Peachpit Press '94).*

Why Jim Clark Loves Mosaic

When *Wired* last spoke with Jim Clark, in the fall of 1993 for a profile of Silicon Graphics Inc. (issue 2.01, page 116), he was chair of the red-hot company that continues to dominate 3-D interactive computer graphics. But Clark was clearly unhappy with how he'd been treated at his own company, and during the course of a lengthy interview, he let his hair down, revealing that he almost resigned when SGI executives, including company president Ed McCracken, were resistant to his ideas for bringing the company into the future.

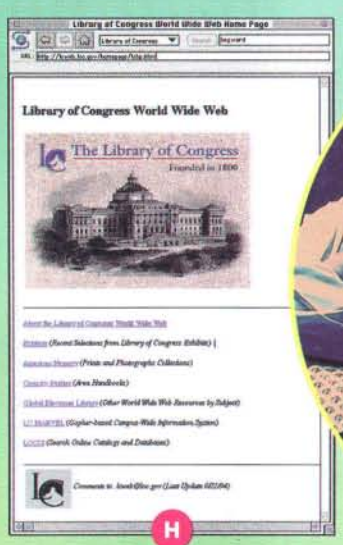
What he didn't say then was that while it appeared that SGI was adapting to Clark's view of the future, a future in which SGI technology would fuel interactive-TV networks and Nintendo videogames, he was viewed less like a visionary than as an eccentric uncle – tolerated, but not taken very seriously. "I was not happy there for about four years," Clark now says. "It was too much of a struggle to get anything done."

So in a February 1994 SGI board of directors meeting, Clark handed in his resignation. Within weeks, he was talking vaguely about a software company that would develop graphical user interfaces. During one conversation with *Wired* more than a month before he made public his new company, his response to a casual question about his thoughts on Mosaic elicited a telling reply: "Why are you asking me that?" He suddenly sounded wary, almost paranoid.

In April, Clark announced that he had formed Mosaic Communications Corporation – which would be producing a commercial version of Mosaic with new and improved features – with Mosaic author Marc Andreessen.

Michael Goldberg met with Clark at his new offices in Mountain View, California. After years of frustration at SGI, he seemed content.

Wired: Six months ago, you were chair of the board of Silicon Graphics; now you're heading a new software company, Mosaic Communications Corporation. How did that come about?



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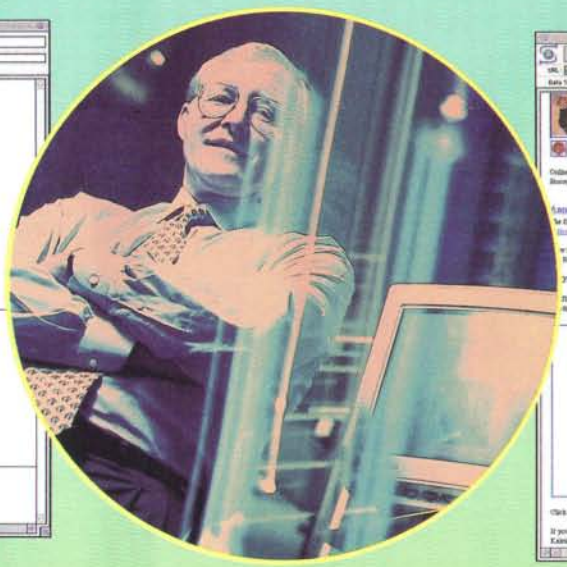


I

After leaving Silicon Graphics, Jim Clark wanted to get into the interactive-television business, but wasn't sure where fire would next strike. With Mosaic, Clark (left) thinks he has found the spark.

sympathy for the administrator of his e-mail account.

Other Web wizards agree. "Mosaic is about to get a boot up the backside," says an experienced developer at CERN in Geneva. "There are an awful lot of good browsers coming out. Mosaic isn't the only one."

These kibitzers are correct: Mosaic isn't the only one. And yet Mosaic is the one that did the trick. The Web statistics tell the tale plainly. The explosion of interest in the World Wide Web began as soon as Andreessen's first Mosaic browser appeared. At that time, in January 1993, there were 50 known Web servers. By October, there were more than 500. By June 1994, there were 1,500.

The secret of Mosaic's success is no mystery. When you browse with Mosaic, you see a series of well-proportioned "pages," with neat headlines and full-color images. You can fiddle with the screen to suit your own preferences. (I like grayish-purple text, with links in blue.) You can mark your progress forward and back in the Web, and make a "hotlist" of places you visit often. On the Macintosh version, which I use, you move up and down the page in the conventional fashion, using a scroll bar on your right.

Mosaic may not be a work of technical genius, but it is hard to stop using. Every day, interesting new hypermedia documents appear. Andreessen and other developers claim there are already at least a million copies of Mosaic on computers around the world.

At the same time, it's hard not to sympathize with the naysayers' irritation. Mosaic illustrates an axiom that many brain-workers find dismaying: looks count. But advocates of hypertext have been struggling to realize their dreams for years without success, and the shadow of disappointment that surrounds the names of earlier hypertext projects – such as Ted Nelson's Xanadu or Bill Atkinson's Hypercard (both of which represented a set of highly interesting ideas about interconnected information) – contrasts sharply with what Mosaic has achieved.

This aesthetically pleasing browser has begun a revolution in the way we experience knowledge. In the world of the Web, knowledge is not something you produce, but something you participate in. A document isn't a self-sufficient individual creation, but a perspective, or collection of perspectives, on the entire Web.

This may sound abstract, but with Mosaic on your screen, it is suddenly, strikingly concrete. All the documents in the Web are within reach. What path will you take to get to them? What path will you mark for others to take?

Going Commercial

Although the NCSA versions of Mosaic are still free, a number of for-profit software companies have purchased nonexclusive licenses to sell and support it. The exception is Jim Clark's Mosaic Communications, which, rather than license the source code, simply hired a half dozen programmers away from the NCSA in order to reengineer a Mosaic-like browser of its own. To license Mosaic, as of July 1994, the NCSA is charging an initial fee of US$100,000 plus $5

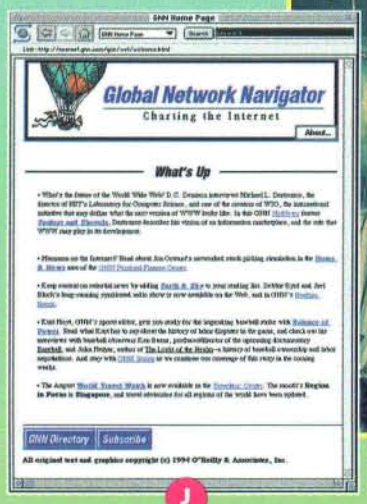
Jim Clark: A lot of the things that I was trying to get done at SGI were going as rapidly as a company that size was going to be able to push them. I wasn't happy with the pace.

What was wrong?

SGI isn't pushing volume into the marketplace. Volume is going to set the standard and it may be already too late. My challenge to the company is make that technology available at prices that are competitive with PCs. It's doable; just do it. That's what I used to tell them, but no one ever got it. If I wanted to right now, I could just blow SGI to smithereens. I'd never do it. But all that's got to happen is somebody takes the basic graphics library – there's no patent on it, I had that technology, parts of it, before SGI ever started – and builds an absolutely killer chip. It does take some knowledge, and – fortunately for the company – most of that knowledge is held within SGI. But just build it, design it. Design it for ultra-high volume, strike a deal with Bill Gates. Say: "You embed this set of graphics calls into your operating system, and I will sell this chip set, just like Intel sells the X86. We have a balanced CPU and graphics system; you support it in your software. And there would be no reason to buy these high-end expensive things that SGI sells." But I'm not going to do that. And I don't think anybody else has either the knowledge or the ability to muster what would be required. But it could be done. That's their most serious vulnerability. It's an excellent group of people but they – and people at every other company – begin to define themselves by what they have been doing, not by what they can do.

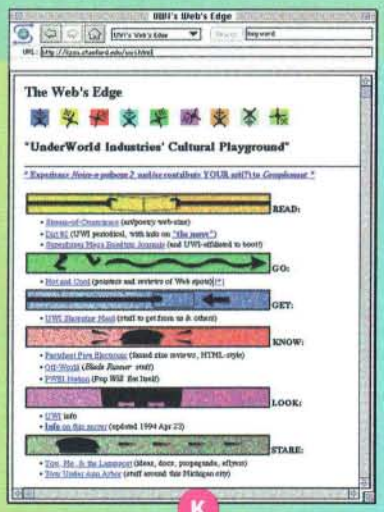
That seems to be human nature. It's comfortable.

Something has gone wrong when you stop valuing the person that tries to set a little bit of farsightedness. I didn't feel valued there. I feel incredibly happy to be out of that place. It was too much of a struggle to get anything done. And that's too bad. It's a sign of bad things when a company **154** ▸



J

Clark and Andreessen were going to try to pick off the NCSA Mosaic team (left) one at a time, but then they realized it was only a matter of time until someone else did. They grabbed the key developers in one day of hotel-room meetings.



K

Mosaic is a graphical browser for the Web. Say what?

The **World Wide Web** (aka WWW, the Web) is a unified "information space" that consists of hypertext documents and links between documents.

Hypertext is a word coined by Ted Nelson to describe a seamless world of information, in which any part of any document can be linked to any part of any other document.

A Web **browser** is a computer program that retrieves and interprets documents on the World Wide Web. Mosaic is a browser that offers a graphical user interface, but not all browsers do. Lynx, for instance, is a popular text-only browser.

HTML (HyperText Markup Language) is the high-level programming language in which World Wide Web documents are written.

A **SLIP** (Serial Line Internet Protocol) connection provides a way for hosts and networks to link into the Internet via phone lines.

The **URL** (Uniform Resource Locator) is the address of a document on the World Wide Web.

each for any number of copies. Licensees are encouraged to enhance Mosaic and resell it to consumers. In June, Fujitsu announced a Japanese Mosaic priced at ¥5,000 (about US$50). SPRY Inc., in partnership with O'Reilly and Associates, a San Francisco Bay area publishing company, plans to have a shrink-wrapped, user-friendly product called "Internet in a Box," including Mosaic, on the shelves by fall.

Jeff Stockett has other plans. He is one of the owners of Quadralay Corporation, a Mosaic licensee in Austin, Texas, that is retooling the browser slightly and repackaging it as an online customer support and service system. Quadralay has also announced a consumer version of Mosaic for Windows, officially priced at US$249. Stockett admits that Mosaic is not the last word in browsers. "There may be something that comes tomorrow that transcends anything we have seen thus far," he says. "Sometimes I think that Mosaic may be the VisiCalc of the '90s."

Maybe, but, then again, maybe not. "When VisiCalc first came out, it could run on every damned 8086 in the known universe, with nothing added, nothing extra," writes Rob Raisch, president of The Internet Company, a technical services firm in Cambridge, Massachusetts. Raisch insists that the current network is simply not ready for Mosaic and estimates that because graphical Web browsers like Mosaic require a high-speed connection to the Internet, they can run on no more than 2 percent of all currently Internet-connected machines.

On the other hand, entrepreneurs like Stockett know that VisiCalc – a simple spreadsheet program for personal computers – eventually morphed into Lotus 1-2-3 and helped launch a complete transformation in business computing. Mosaic's impact could be even larger, for its potential market includes not only businesses, but every individual who wants access to electronic information. Consumers whose Web browsers choke on

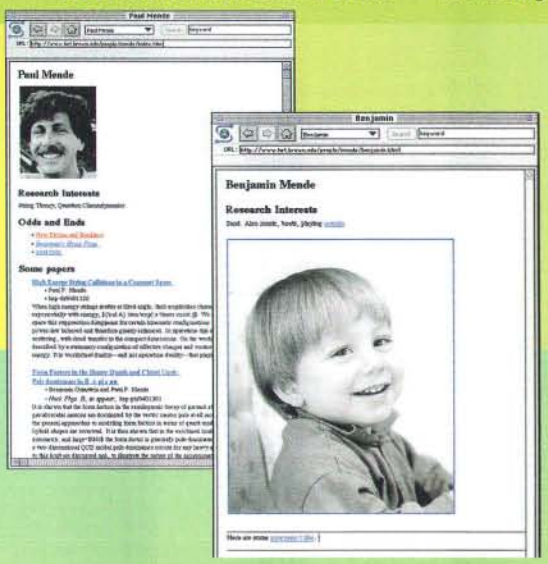
Why I Dig Mosaic

Last night Mosaic blew my mind. It was not the underlying technical elegance of the browser, for Mosaic functions lurchingly, with many gasps and wheezes. Images traveling through the Net don't appear quickly, even when they flow through a 56-KByte line. But Mosaic blew my mind nonetheless. With seamless grace, it brought me in contact with information that I didn't know I wanted to know.

I launched Mosaic for a prosaic reason: to track down some details about the World Wide Web on the pages at CERN in Geneva. But I typed the address incorrectly – or had copied it down wrong – and I soon found myself wandering aimlessly along the interwoven strands of the Web, listlessly clicking on links, circling in the near vicinity of CERN (not geographically, of course, but along vectors of association), hoping in a rather lame way to hit on the document I was looking for. Finally, I found myself standing on the NCSA demo page (A), much as tourists wandering through the complex alleys of an old city will, when their energy runs out, eventually walk along with the flow of traffic and find themselves in one of the main intersections or town squares.

Many documents are linked into the NCSA demo page, which is full of links leading out into the Web. I scanned down the lines of gray text and selected a blue link that had nothing to do with my official mission: "An experiment in hypermedia publishing: excerpts and audio from a book reading by author Paul Kafka of his novel *LOVE Enter*," it said. This, I hoped, would be a nice breather.

Upon entering the page, I was immediately distracted by another link, a quiet alcove halfway down that read poetry archive. I wanted to see the poetry archive. I clicked. "Unable to connect to remote host," Mosaic responded. I was peeved. The door was locked! I clicked a link at the bottom of the screen, where the name of the author of the page was listed: Paul Mende. After a minute of waiting (not unusual), Mende's picture



I clicked on Benjamin's Home Page, and a beaming, gap-toothed 3-year-old filled my screen. The top of the screen announced that his research interests were, "Sand. Also music, boats, playing outside."

(L)

the incoming data are likely to join the clamor for a better network with higher bandwidth. Whether the Net can answer this demand – technically, commercially, and socially – remains to be seen. "If people continue to sell Mosaic as the easy way to market to more than 25 million willing Internet consumers, we are heading for a 'marketing crash' of immense proportions," Rob Raisch warns.

One thing is clear: with the commercialization of Mosaic, the global network of hypertext is no longer just a very cool idea. It is now a global competition. The second phase of the revolution is about to begin.

The Man and the Myth

I first meet Marc Andreessen, accompanied by his publicist Rosanne Siino, in the fifth-floor reception area of Mosaic Communications's Silicon Valley headquarters. As Andreessen gets a glass of water from the nearby kitchen, he takes approving notice of the stash of Oreo cookies in the cabinet. We retire to a conference room, which is bare except for a table, chairs, and a large jar of M&Ms.

Andreessen mentions that at night, when the office is full and the tables are littered with pizza boxes, Mosaic Communications doesn't seem all that different from the environment back at the NCSA. But this afternoon, the comparison seems forced. Other than Siino and a receptionist, there is nobody else in the office. The air-circulation system is humming. The setting is quiet and corporate. A little way into the interview, Andreessen removes his dress shirt and answers the rest of my questions in a white T-shirt. This gesture, combined with cautious answers to my questions, leaves the impression of a man doing battle against the businesslike backdrop – and losing.

Two years ago, Andreessen was one of a handful of programmers who were taking an interest in Tim Berners-Lee's research on the World Wide Web. To Andreessen, who says he majored in computer science because electrical engineering was too much work, the lack of an easy-to-use graphical interface for the Web was a glaring omission.

"There was this huge hole in the world," says Andreessen, "because a network existed with all these people hooked up to it, and the software was 10 years behind the hardware. This is typical of the personal computer industry today," he continues. "Perhaps because of people like me." Andreessen argues that people who write software are often people who, like him, are daunted by building hardware. Therefore the machines outstrip our capacity to use them.

When Andreessen's first Mosaic release at the beginning of 1993 seemed to strike a chord with Web users, other developers joined in the effort. Chris Wilson, 24, who now works for SPRY Inc., went to work on a Windows version. The center retained ownership of the software but made it available free for individual use. As Mosaic spread through the Internet, Wilson could see problems looming. It was tricky to load and operate, and users around the world began besieging the NCSA with demands for help. "The center was just getting swamped," says Wilson. "They were hiring new people as

appeared. He was smiling and young, with bushy brown hair and a large mustache. His page listed his research interests: "String Theory, Quantum Chromdynamics." Then came a section called Odds and Ends, under which were listed New Fiction and Readings, Benjamin's Home Page, and "local docs." What were the local docs? Who was Benjamin?

Before finding out, I glanced at the rest of the document, and it was then that I began to experience the vertigo of Net travel. On the lower parts of the page were abstracts of Paul's scientific papers, some co-authored with Benjamin Grinstein. "High energy string collisions in a compact space," was one of the titles. This meant nothing to me, of course. But, having sought a respite in poetry, it was dizzying to have wandered into the company of a physicist.

It was a type of voyeurism, yes, but it was less like peeking into a person's window and more like dropping in on a small seminar with a cloak of invisibility.

One thing it was not like: it was not like being in a library. The whole experience gave an intense illusion, not of information, but of *personality*. I had been treating the ether as a kind of data repository, and I suddenly found myself in the confines of a scientist's study, complete with family pictures.

When I clicked on the link titled Benjamin's Home Page, I found that it did not belong to Benjamin Grinstein, Paul's scientific co-author, but rather to Benjamin Mende, his son, a beaming, gap-toothed 3-year-old, who announced at the top of the page that his research interests were, "Sand. Also music, boats, playing outside."

"Playing outside" was a link to a picture that filled my 21-inch screen. Benjamin was sitting on the grass in a hooded sweatshirt, wearing corduroy booties, laughing.

It was late. I'd been in Paul Mende's life for an hour. I turned the computer off. It was not until this morning that I remembered I had never made it back to CERN.

– *Gary Wolf*

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Cool Web Pages: A Sampler

Interactive Frog Dissection B
http://curry.edschool.virginia.edu/~insttech/frog/
See how a frog fits together. Guaranteed formaldehyde-free.

Le WebLouvre C
http://mistral.enst.fr/~pioch/louvre/
Tour the world-famous Louvre.

Xmorphia D
http://www.ccsf.caltech.edu/ismap/image.html
Supercomputer-created images and MPEG movies.

NetBoy E
http://www.interaccess.com/netboy.html
Comics for the hardcore geek.

Shoemaker-Levy F
http://seds.lpl.arizona.edu/sl9/sl9.html
Everything you wanted to know about the comet collisions last July.

Gallery of Interactive On-Line Geometry G
http://www.geom.umn.edu/apps/gallery.html
Create Penrose tiles, generate Escher-like patterns, and use a prototypical 3-D viewer through this page at the University of Minnesota.

Library of Congress H
http://lcweb.loc.gov/homepage/lchp.html
Offerings from the nation's library.

Kaleidospace I
http://kspace.com
Material from writers, artists, musicians, and videographers. The Kspace people charge a nominal fee to digitize and publicize unknowns.

Global Network Navigator J
http://nearnet.gnn.com/gnn/gnn.html
O'Reilly & Associates's online magazine and resource center.

The Web's Edge K
http://kzsu.stanford.edu/uwi.html
A well-designed launchpad to offbeat strands of the Web.
http://kzsu.stanford.edu/uwi/reviews-l.html
What's "Hot and Cool."

Sun Microsystems L
http://www.sun.com/
Product info, service and support areas, new-release announcements, and links to other sites using Sun hardware.

HotWired M
http://www.hotwired.com
What can we say? It's a cross between *Pee Wee's Playhouse* and *Wired* magazine.

WWW Robots, Wanderers, and Spiders N
http://web.nexor.co.uk/mak/doc/robots/robots.html
Programs that traverse the Web automatically.

Internet Underground Music Archive O
http://sunsite.unc.edu/ianc/index.html
Indie music on the Net.

Links from the Underground P
http://raptor.swarthmore.edu/jahall/
Links and commentary providing an alternative view of the Web.

quickly as they could, and there was no way to get through the backlog."

"We got calls from people saying, 'How can we get it?'" Andreessen recalls. "Then we got calls saying, 'What do we need to run it?' We even got a couple of calls saying, 'Do you need to have a computer?'"

As the Mosaic craze grew, commercial pressure on the young developers was also mounting. The NCSA's mission includes "technology transfer" – the licensing of its inventions to commercial companies. But the developers were not likely to see much of the profit. "Companies started to come to us," reports Andreessen. "They were saying: 'Let us have it, how much do we pay? We'll give you money!'"

Neither Andreessen nor Wilson enjoyed being in an environment with many of the pressures of a commercial software company, including user sup- 150 ▶

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Sega Ltd.

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Isaac Asimov's The Ultimate Robot

Producer Byron Preiss has done a superb job bringing the ideas of the late Isaac Asimov to this CD-ROM, which touches on almost all topics related to robots and robotics.

You'll learn about the history and principles of robotics, and hear and see Asimov himself discuss the field. The Robotoid Assembly Toolkit (created by Ralph McQuarrie, the production designer for *Star Wars*) lets you build, animate, and save or print images of the virtual

Asimov's robot-o-rama.

robots you construct. You can also see film clips of famous and not-so-famous movie robots or read from the sizable collection of Asimov's short stories and essays. His "Three Laws of Robotics" are discussed in detail, as are their impact on literature and actual science.

Without a doubt, *The Ultimate Robot* lives up to its name. This is a must for any Asimov fan. – *Gene Alloway*

Isaac Asimov's The Ultimate Robot for Mac and Windows: US$64.95. Microsoft Corp: (800) 426 9400, +1 (206) 882 8080.

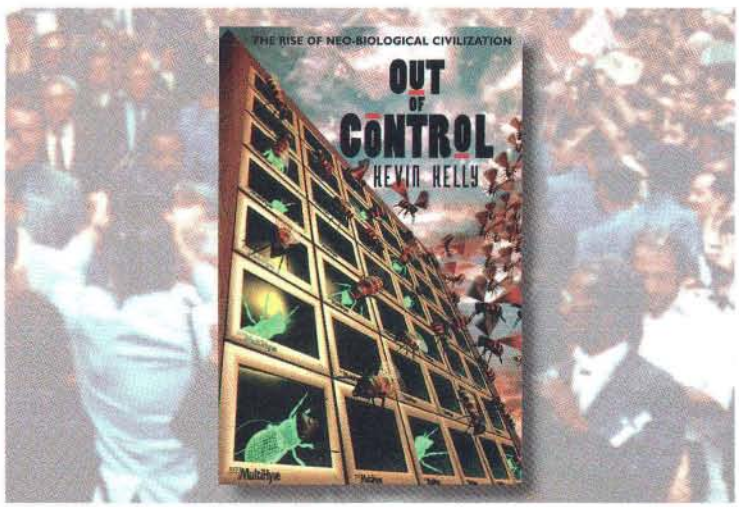
Out of Control

Kevin Kelly's *Out of Control* offers a genuinely new, idealistic, futuristic vision of our relationship with technology. And I'd say that even if he weren't my editor at *Wired*.

Out of Control is about complex, chaotic systems, from swarms of bees to swarms of people, from flocks of birds to colonies of cells. Kelly finds that these entities can flourish intelligently, even though their members are unaware of the big picture and there is no "leader" to guide them. The group is out of control – a state Kelly defines as "distributed being." Since this is the preferred mode of complex biological forms that have been thriving for millions of years, Kelly suggests that our own increasingly complex electronic/technological systems should follow the same pattern.

This is argument by analogy, which ordinarily tends to be weak. Kelly makes it persuasive, though, because his great breadth of knowledge helps him to find so many parallels.

He processed a mountain of material, listing 170 personal sources and



***Out of Control:* Biology isn't just for carbon anymore.**

almost 300 titles in an annotated bibliography. There are fascinating examples and memorable thumbnail character studies on almost every page. In this sense, the book itself is a complex system – a seething mass of facts and ideas. Gradually, however, what emerges is a vision of how things work, how things fail, and how we should structure our world as we enter the 21st century.

What bothers me is that this beatific picture of group behavior seems to offer little room for renegades. Evolution is triggered by mutations; technology is enabled by inventors with "crazy" ideas; commerce is invigorated by ornery entrepreneurs. Progress, in short, tends to be catalyzed by creatures that violate the group consensus. Can an uncontrolled, self-governing system be flexible enough to accommodate troublemakers who threaten its own stability? I would certainly like to think so.
– *Charles Platt*

Out of Control, by Kevin Kelly, US$28. Addison-Wesley: (800) 822 6339, +1 (617) 944 3700.

Almost an Implant

My mom used to tell me not to put anything smaller than my elbow in my ear. I just broke Mom's rule, and it was worth it.

A single bud earphone, called the "World's Smallest FM Radio," comes with hard-shell carrying case, two different detachable antennae (a short, stiff wire for local reception and a longer, flexible wire for more pull), and an extra pair of tiny, commonly available batteries. It's comfortable, thanks to its diminutive size and weight, and a handy ear clip helps it stay in place.

Don't expect it to compete with a Walkman, though. You can't skip to your favorite station – the scan button jumps one station at a time with each push, and the reset button starts at the beginning. Also, the power switch serves as a two-position volume control, and "high" isn't very. In a noisy crowd it's not so hot, but in a quiet park or building it's fine. And, hey, it sounds better than your elbow. – *Andy Eddy*

Good earwig barrier, too!

FM Sounds: US$19.95. American Technology Corporation: +1 (619) 679 2114.

Jurassic Park Underactive

Amazing. Simply amazing. It took no fewer than 18 programmers, graphic artists, and sound technicians to take the most exciting flick of 1993 and turn it into a bunch of extremely dull arcade sequences linked together by silly full-motion video clips of people running through jungle scenery. (Remember 10 years ago, when it took only three or four programmers to turn a great movie into a terrible game?)

Jurassic Park Interactive gives two objectives to the person bored enough to be playing it: rescue five to eleven endangered visitors, depending on skill level, by guiding them to Isla Nublar's heliport, and crack the park's Engineering System computer to recall a raptor-laden cargo ship headed for Costa Rica.

Rescuing the visitors means playing three different sequences. "Spitter Shoot" is a first-person shoot-'em-up where you blast fast-moving Dilophosaurs with an electro stun-gun; it's challenging, but extremely boring by the fourth go-around. "T-Rex Chase" is an atrocious driving sequence that has you outracing the hungry tyrannosaur in a Ford Explorer; the highly repetitive scenery and the terrible collision-detection

A game without much of a challenge from a movie without much of a plot.

(which makes it all too easy to crash into roadside debris) add up to boredom and frustration. "Raptor Maze," the only half-decent sequence in the game, is a slightly souped-up version of the graphic engine used in another 3DO game, *Escape from Monster Manor* (which is in turn a knock-off of the PC game *Wolfenstein 3-D*).

The worst sequence is the Engineering System computer, in which you're forced to play five games based on late 1970s coin-ops, like *Space Invaders*, *Galaga*, and *Asteroids*. Interactive? You betcha. Interesting? Not even remotely.

At least Universal Interactive has hope of redeeming itself in the eyes of now-wary 3DO owners: their upcoming beat-'em-up, *Way of the Warrior* (demoed at June's Consumer Electronics Show), promises to have more gore, more secrets, and better audiovisuals than that current king of fighting games, *Mortal Kombat*. – *Zach Meston*

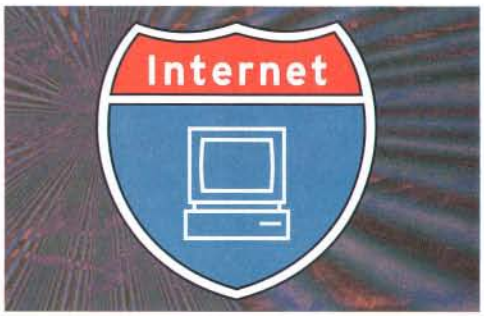
Jurassic Park Interactive for 3DO: US$59.95. Universal Interactive Studios: +1 (818) 777 8934.

Slip into the Net with Shareware

Mosaic is a great way to browse the World Wide Web, but you need a true Internet Protocol connection to be able to use it. Just having a modem and an account on AOL won't cut it. So I got a SLIP (Serial Line Internet Protocol) connection from my Internet vendor. My cost was minimal: US$25 per 20 hours of connect time from MV Communications in New Hampshire. Many vendors charge a one-time installation fee for the SLIP line – usually $200-$300. MV Communications did not.

And to fully exploit my real IP connection to cyberspace, I downloaded Winsock, a shareware program ($20 for a single user license) that allows multiple applications – Mosaic, gopher, ftp, and telnet – to run during the same session.

During a typical trip on the highway, a Mosaic hypertext document guides me through gifs and gophers, movies and text. Pull-down menus drop protocols and ftp commands into the background. Files are downloaded where they belong. When a graphics download slows me down, I open a new window, fire up Hgopher and tunnel down another



Shareware: A cheap way to travel down the I-way in style.

path. In yet another window, I launch a telnet connection with WinQVT/Net – a multi-window emulation program – which can run as many as 12 telnet, ftp, and mail sessions concurrently. Eudora – my mail client – sleeps in the background, polling my server every 10 minutes. When mail arrives, a mailbox icon appears. It does not matter whether the mail comes from a Mac, Sun, or PC, Eudora automatically translates the notes and attachments. Another click, my mailbox disappears, and I continue my travels.

I've caught a glimpse of the fiberoptic superhighway that lies just over the horizon, and it makes me crave more – a faster modem, an ISDN or Ethernet connection, more bandwidth in any form. When I get it, watch out! – *John Ost*

Trumpet Winsock: ftp.utas.edu.au/pc/trumpet/winsock.
PC-Mosaic: ftp.ncsa.uiuc.edu /PC/Mosaic
Eudora: ftp.qualcomm.com/quest/eudora/../windows/eudora/1.4
WinQVT/Net: ftp.cica.indiana.edu pub/pc/win3/uploads
Hgopher: gopher.ic.ac.uk

TUNNEL BACKGROUND: BRAVE NEW MEDIA PUBLISHING

Unidentified Spinning Object

How could I, a fan of *The X-Files*, not want a peek at the *UFO* CD-ROM for Windows? This disc holds information on more than 1,200 sightings, abductions, crop circles, and those ever-popular cattle mutilations from 1000 BC to the present day.

Using the CD-ROM's map and time line to search out sightings is a lot of fun, as is reading the discussions of the events. Some of the video clips and pictures are really great, though others might

Invasion of the hubcaps.

as well be snapshots of CD-ROMs thrown into the air.

Some added functionality, like keyword searching, and a few artist's renderings of non-photographed sightings would have made this an A+ product.

Taken as is, it's better than a poke in the orifice with an alien abductor's sharp diagnostic implement.
– *Stephen Jacobs*

UFO: This Planet's Most Complete Guide to Close Encounters: US$59.95. Software Marketing Corporation: (800) 364 5451, +1 (602) 893 3377.

Madonna's Worst Nightmare

Xuxa is like a character from a porn movie written by Baudrillard and directed by McLuhan. She's the first Latin American entertainer ever to make the *Forbes* list of big-money stars. Her most accessible face is as the host of a phenomenally successful Brazil-based children's show (available in most US cities on cable). But even that benign image is rife with contradictions: Xuxa's kiddie show, *Xou da Xuxa*, is a construct as well planned and ordered as neurosurgery, a bright and rapid-fire combination of songs, games, and teasing sexuality. Xuxa (pronounced "soo-sha") plays host in hot pants and tiny tops. She is surrounded by equally leggy teenage nymphets – the ever present *paquitas*, who keep the show moving and the kids in line. As a media package, Xuxa is almost perfect. Her combination of sexy moves and maternal images continues to short-circuit both the dullness of kiddie-show formulas and complaints about her erotic persona. She's Mommy and Temptress in one buns-of-steel, Aryan-wetdream package, as popular with dads as she is with the kids.

It's no accident that Xuxa's star first rose in Brazil, a country notorious

No matter who or how old you are, you've got a reason to like Xuxa.

for watching more TV than any other nation in the region. Xuxa is a product of mega-TV marketing: throughout South America, Xuxa's face graces not only her show, but a magazine, modeling school, travel agency, limo service, line of clothing stores, bikes, yogurt, surfboards, shampoo, cosmetics, and soup.

Amelia Simpson's book, *Xuxa: The Mega-Marketing of Gender, Race, and Modernity*, looks at the ubiquitous pop goddess's early days as a *Playboy* model and soft-core porn actress, as well as her more recent successes. Simpson focuses on Xuxa as media construct and marketing device, dissecting the star's selling of "gender, race, and modernity."

The book examines Xuxa's fame and what it reveals about Brazilian culture and, by extension, the image-hungry and well-wired First World, too. – *Richard Kadrey*

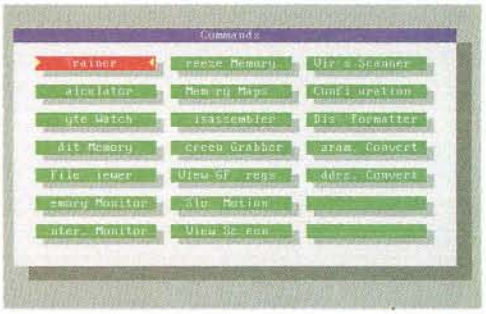
Xou da Xuxa: weekly, check local cable listings. *Xuxa: The Mega-Marketing of Gender, Race, and Modernity*, by Amelia Simpson, US$14.95. Temple University Press: (800) 447 1656, +1 (215) 204 8787.

If You Can't Win, Cheat

In the carefree days of my youth – five years ago – I published a 'zine called the *Amiga Games Guide*. I had no problem with the text portion of the 'zine, being the uncanny wordsmith that I am, but I had a major problem obtaining screen shots. At first, I tried taking pictures of the monitor – an analog pain in the ass.

Then I discovered Action Replay, a cartridge from British company Datel Electronics, which plugged into the side of my Amiga 500 and gave me the ability to take screen shots with the touch of a button. It also had a second, even more useful, function: it let me hack into my games and endow myself with infinite lives, loads of cash, and other keen abilities. (Not that I needed to cheat at games, of course.)

Now that MS-DOS machines have become the UK's game-playing computers of choice, Datel has created Action Replay PC, a plug-in card with most of the features and functions that made the Amiga version



Computer games: Make up your own rules from now on.

so great: screen capturing, game hacking, adjustable slow-motion, virus detection, and the ability to modify and save the entire contents of RAM.

There are a few niggling flaws: Action Replay PC doesn't do Windows, which means no fooling around with the large number of Windows-only games; the Action Replay PC "remote control" has an extremely annoying blinking green light to show that the card is active; and the documentation is definitely on the skimpy side. At least Datel kindly included a sample game to help you fine-tune your hacking skills before moving on to the likes of *Doom* and *SimCity*.

The verdict: Action Replay PC is the keenest peripheral I've bought since my Sony double-speed CD-ROM drive. Well worth the *dinero* of any serious PC gamer. – *Zach Meston*

Action Replay PC: US$89. Datel Electronics Ltd.: +44 (78) 274 4707, fax +44 (78) 274 4292.

Happiness Is a Juicy Battery

I was disappointed to learn how fast my new laptop sucked its battery dry. The little power indicator window reminded me of someone smoking a cigarette and letting the ash grow to an obnoxious length. So much for King of the Road.

I was ready to resign myself to being Earl of the Extension Cord when I remembered the free quarterly catalog I got a few months back: *Power Express*. They sell stuff to keep you from making frequent visits to the AC power outlet, such as rechargeable batteries and battery management

No-Doz for laptops.

software.

I ordered the US$79 Ultra Capacity with Charge Indicator battery for my PowerBook 165 (and saved $2 by faxing the order). It took a few charge/deplete cycles to whip it into shape, but now I get a three-hour reprieve from the wall socket, compared with an hour and a half from Apple's standard-issue battery.

Riding on a plane has become a little more bearable, but I'm still not happy: I wish I could afford to plug my RJ-11 connector into the $2-a-minute AirPhone jack. – *Mark Frauenfelder*

Power Express: (800) 769 3739, +1 (408) 559 4848, fax +1 (408) 559 5969.

Comic Book Confidential

The animated versions of my favorite comic book characters never quite lived up to the excitement of reading the comics. Spider Man's money problems, or Richie Rich's lack thereof, didn't seem palpable without the combination of static art and word balloons. A notable exception to this was Marvel's "animated" features of the '60s, where the camera moved around the panels of the comic book (with accompanying voice-over and sound effects), preserving the integrity of the material.

Comic Book Confidential's creator/director, Ron Mann, calls this process "filmography;" his use of the process is a reason why his documentary so successfully captures the essence of comics. Mann spans a wide range of creative forces in comicdom: from Stan Lee and the late Jack Kirby to underground legend R. Crumb – all of whom narrate selections from their cinematically agitated work.

Now Voyager has developed a CD-ROM version of Mann's movie. Having the icons and innovators of the comic world interpret their visions as they come to life on the screen is a rare treat – and *Comic Book Confidential* never lets go of that thrill.

Comic Book Confidential: **a CD-ROM movie into the minds of cartoonists.**

Keeping with Mann's concept of comics as a complete art form, the CD-ROM contains not only the entire 84-minute movie, but also more than 120 digitized pages of the featured artists' work.

The complete text of the Comics Code is the most clever addition, as the film in part centers around its effect on the comic book industry. Reading it, you'll relive the hysteria of 1954, when the Senate Subcommittee on Juvenile Delinquency was up in arms over horror and crime comics, with their garish depictions of the dead and the undead. The biggest scare of the CD-ROM could be reading the constricting "standards" the publishers were forced to conform to.

By toggling back and forth from the film to the artists' bios and the Comics Code, *Comic Book Confidential* vividly explains how comics overcame and eventually outgrew their obstacles, and proves indispensable for newbies and true believers alike. – *Dan Sicko*

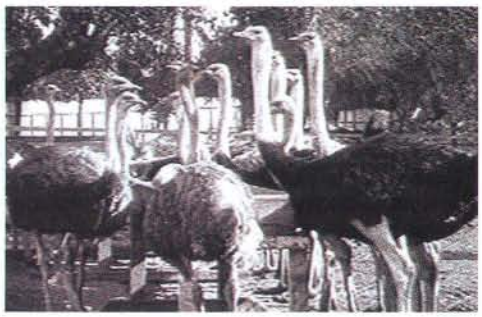
Comic Book Confidential, by Ron Mann, US$49.95. The Voyager Company: (800) 446 2001, +1 (914) 591 5500.

Los Angeles by Laserlight

Voyager's laserdisc *L.A. Journal* has 25,200 pristine, still views of Los Angeles (past and present), as well as a 14-minute hypersonic drag race through the collective unconscious of this most elusive of American cities.

Are you a browser or a sprinter? Sprinters can blow through these still frames with all the vertiginous glee of the time traveler in George Pal's movie version of *The Time Machine*. Browsers needn't worry, however. The disc is laid out in 19 major sections, with 57 subsections, each of which you can access using your laser player's "chapter skip" and "step" controls. Highlights include a tour of Watts Towers, Michael Dare's manipulated Polaroid portrait collection, the Gay Pride parade, and a warehouse wall turning from blank gray to a piece of high graffiti art. You can also see archival film clips of, among other things, the old trolley system and an ostrich farm.

Not only can you look at *L.A. Journal* in different ways, but you can listen to any of three audio tracks



A hypersonic drag race through LA's collective unconscious.

at the same time. Track one features an original music piece from Southern California's electronic composer-whiz, Carl Stone. His music matches the headlong rush of the faster-than-fast visual mode, like a demon-possessed carousel organ. The second track consists of spoken-word pieces by Angelenos such as Wanda Coleman, Marisela Norte, Tommy Swerdlow, Harvey Kubernik, and Pleasant Gehman. Track three is a collection of archival music recordings of LA music from 1904–1937; there are songs of the Cahuilla Indians, and turn-of-the-century Hispanic tunes, as well as a couple of jazz tunes, one of which is by a band with the ultra-cool name of Spike's Seven Pods of Pepper Orchestra.

L.A. Journal* is not a definitive look at Los Angeles (the producers knew that was impossible). Instead, using a technique they call "animated photojournalism," the Voyager crew has captured a moment in time, a portrait of 1990s LA that shows the city chaotic, hyperbolic, baked in desert sun, and as fascinating as ever. – *Richard Kadrey

L.A. Journal, Vol. 1: US$24.95. The Voyager Company: (800) 446 2001, +1 (212) 431 5199.

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VID GRID is the totally cool, new CD-ROM game that jumbles up your favorite rock 'n' roll videos and challenges you to unscramble them.

Each video is divided into squares. Your goal is to quickly move the squares into place before the video ends. Once it's unscrambled, just sit back and watch. Or move on to a new video. Or attempt a more difficult level.

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So get ready to take the controls, crank up the volume and conquer the world of VID GRID.

CD ROM GEFFEN JASMINE MULTIMEDIA

ON CD ROM!

Produced by Norman Beil & Jasmine Multimedia

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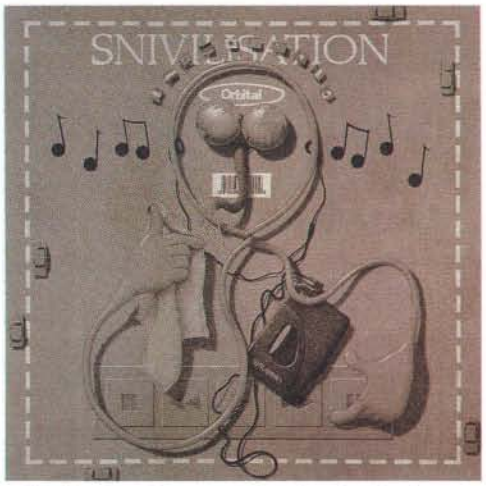
Orbital

Snivilisation
London/ffrr

Access Code 1210

In case you haven't heard, there's a revolution going on in popular electronic music. The scene is fragmenting at a breakneck pace: jungle, trance, hard trance, ambient, ambient dub, ethnotechno. In the midst of all this activity, Orbital has returned to remind us why this music can be so great. Dense vocal cut-ups, alien soundscapes, layers of digital rhythms – this here's sci-fi hi-fi.

No one sums up the current state of techno with as much innovation and elegance as Orbital. Brothers Phil and Paul Hartnoll meticulously craft tracks that take the listener on a brain voyage. *Snivilisation*, their latest, offers prime Orbital electro head music. "We've been left to our own devices," says Phil. "People weren't sure what to make of a techno band that made albums." Now, through the course of three LPs,



Orbital has fused current club styles, classic science fiction themes, and cryptic humor. New tracks such as "Are We Here?" and "Forever" showcase the luscious textures and sinuous grooves Orbital revels in. "We set out to free the listener's imagination," Phil explains. "Our goal is to take someone away, to tap into their subconscious." As a whole, *Snivilisation* is the aural equivalent to the kind of film or book that makes you completely forget where you are – a low-budget, highly effective transporter.

With a clear bow to Kraftwerk and Detroit techno, Orbital keeps its influences in check. Familiar traces drift in and out of the mix but the sound remains their own. In between forays into Net surfing, obsessive tracking of *Star Trek: The Next Generation*, and constant touring, Orbital gives us earthlings a soundtrack to modern life. – *Scott Taves*

Berlioz

La Mort de Cléopâtre; Herminie; Overtures. Rosalind Plowright, soprano; Philharmonia Orchestra, Jean-Philippe Rouchon, cond.
ASV Records

Access Code 1211

The young Hector Berlioz tried five times to win the French *Prix de Rome* before finally succeeding in 1830. Recorded here are two of those attempts. Seldom heard, they are nonetheless fine pieces, of interest for their use of material that was recycled into later compositions. Plowright lends an appropriate, dark quality to the gloomy subjects, and Rouchon provides adequate, if undistinguished, support.
– *Bryan Higgins*

Deconstruction

Deconstruction
American Recordings

Access Code 1212

Led Zeppelin was a great band. So was Jane's Addiction. Led Zeppelin broke up too soon. So did Jane's Addiction. After Led Zep broke up, Jimmy Page formed a band called The Firm, which sucked. After Jane's Addiction broke up, guitarist Dave Navarro formed a band called Deconstruction, which *really* sucked. Will someone please tell Dave that putting an endless stream of modal wah-wah wank on tape is not the same as writing a song? Thanks. – *Sean Manseau*

Gerogerigegege

Singles 1985-1993
Cargo/Work In Progress

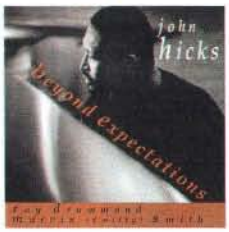
Access Code 1214

Look, I *like* beating off. But I still find a "song" of some guy masturb gmatic, prolific Japanese band. Hear that fine sonic oblivion on "Stairway to Promotion?" "Ai-Jin" is a similarly bruised pop song – originally pressed onto 1,000 flexidiscs, all of which were ritually burned at their own release party. At best, Gerogerigegege mix high-concept and low-tech into an invigorating sonic mess. At worst, they're musical as well as actual onanism. – *Patrick Barber*

John Hicks

Beyond Expectations
Reservoir Music

Access Code 1214



Veteran pianist John Hicks is himself a work in progress, sculpting the established jazz traditions of Bud Powell and Bill Evans into a singular style that combines sensitivity with awesome chops. As one of New York's most in-demand session players, Hicks here presents his own blistering, state-of-the-art trio, exploring a vintage jazz repertoire of up-tempo smokers and quiescent ballads. Drummer Marvin "Smitty" Smith and bassist Ray Drummond heighten the emotions on what is Hicks's best recording to date.
– *James Rozzi*

Luscious Jackson

Natural Ingredients
Grand Royal

Access Code 1215

Here rocks the second album from this foursome of ladies livin' large in a soulful musical space they marked with their début *In Search of Manny*. Guitar melodies glide over funky beats, and lyrics smoothly tell tales of fierce city females. The songs of *Natural Ingredients* conjure the blurred experience of growing up during the '70s and '80s – the needle skipping across Diana Ross and Joan Jett – as the girls give props to the vinyl sisters of soul and rock.
– *Kelly Martin*

MC Solaar

Prose Combat
Island

Access Code 1216

With wit and literacy, MC Solaar's second recording fulfills the promise of World Beat: it is a multicultural parlay of music and an acknowledgment that a Senegal-born, Paris-bred rapper has something to say to you ... yes, you. Weaned on Afrika Bambaata and Big Daddy Kane, Solaar busts his rhymes in French, threading *Combat's* prose pearls onto funky jazz beats on 15 tracks. MC Solaar decries Westernization and advocates positivity and activism over violence and ennui. *C'est une célébration magnifique.* – *Colin Berry*

Orb

Pomme Fritz
Island Red Label

Access Code 1217

On initial listening, many Orbsters will probably be disappointed – there's nothing here with the sweep of "o.o.b.e.," or the darkness of "Assassin." But for those who double as Negativland enthusiasts, you'll enjoy the humorous insanity of samples lauding the benefits of electroshock therapy. "Bang 'er 'n Chips" is the most rhythmic of the lot, but is more an experiment in dub, not dance. You get the feeling that this EP was meant to test the waters of Orb's new label. In that case, *Pomme Fritz* is a great appetizer for the next album. – *Brian Behlendorf*

Gilberto Gil & Caetano Veloso

Tropicália 2
Elektra/Nonesuch

Access Code 1218

Exiled to London by the Brazilian dictatorship, Caetano and Gil released the first *Tropicália* in 1968. By marrying modern influences like the Beatles and Stones to Brazilian tradition and adding their own genius, the *tropicálistas* revolutionized Brazilian music. Twenty-five years later, *Tropicália 2* demonstrates that these poets, hypnotic performers, and consummate musicians are still leaders, creating smart, accessible, soulful, just plain astounding music. This album is essential.
– *Levi Rizetnikoff*

Microwave O' The Month

MICROWAVED CD: LISA SEAMAN

Micky Hart/Taro Hart

Music to Be Born By

Rykodisc

In this 70-minute dirge featuring baby Taro's heartbeat, Hart provides one more reason to scream during labor. My wife and I would be more "Grateful" to hear all eight sides of K-Tel's *Superstars of the Seventies*. Without a break. – *Todd Sotkiewicz*

MUSIC ACCESS

If you'd like to hear excerpts from these discs,

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Touch-tone required. US only.
Under 18? Get parent's permission.

When prompted:
Enter Access Code (under the name of the artist).

Music Controls:
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A charge of 95 cents per minute will appear on your phone bill. An average call is about 2.5 minutes. Music Access samples for reviews in this issue are active September 7,1994 –December 1, 1994.

At the beginning of each music review, you'll find a four-digit code for each album. To hear sample cuts, dial the 900-number below, entering this code when prompted. You'll hear up to three minutes of music, at 95 cents per minute. "Fast forward" by punching 3, louder volume 4, softer 5. To use Music Access, you have to be 18, have a touch-tone phone and dial from the US.

Code	Artist and Title
1210	Orbital, *Snivilisation*
1211	Berlioz, *La Mort de Cléopâtre; Herminie; Overtures.*
1212	Deconstruction, *Deconstruction*
1214	John Hicks, *Beyond Expectations*
1215	Luscious Jackson, *Natural Ingredients*
1216	MC Solaar, *Prose Combat*
1217	Orb, *Pomme Fritz*
1218	Gilberto Gil & Caetano Veloso, *Tropicália 2*

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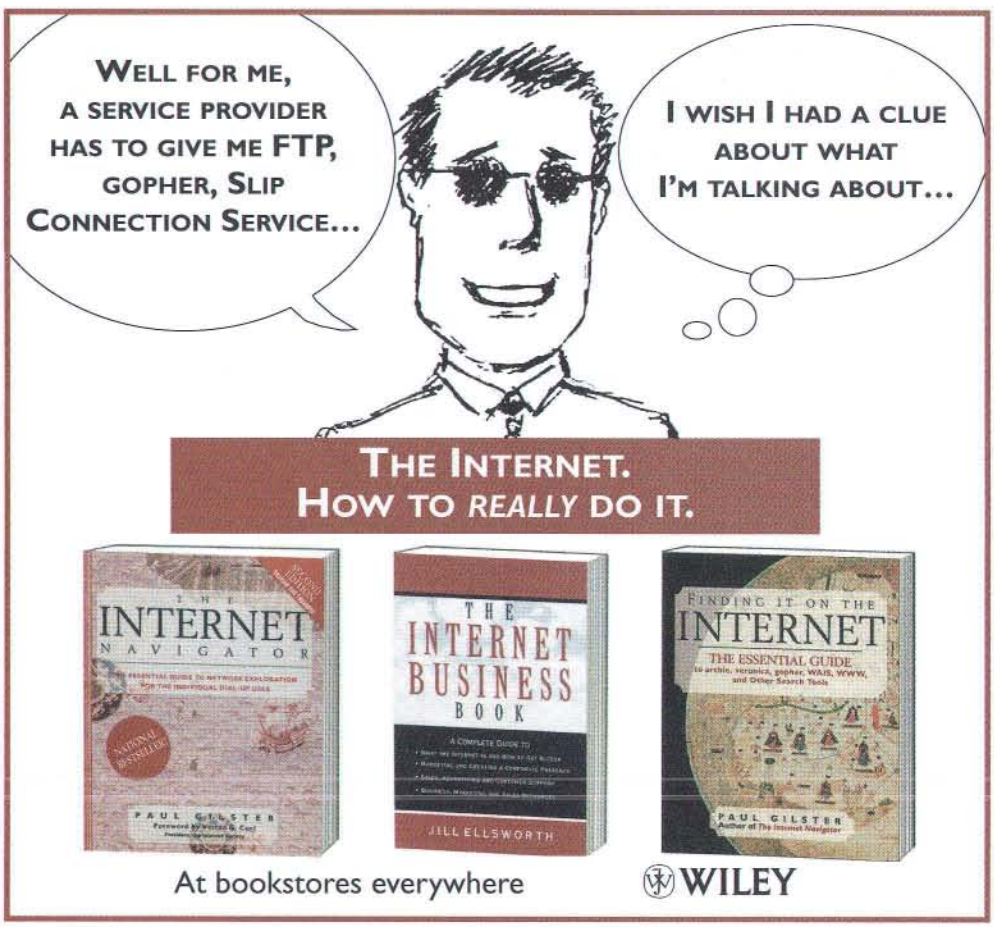


Good Answer

Homes with offices or teenagers will find good use for the Sony IT-A3000 Integrated Digital Telephone Answering Machine. It has three assignable message boxes, but watch out for that 19-minute message capacity, it'll fill up fast. Another handy feature is the jog/shuttle dial that lets you speed up or slow down messages without changing the pitch of the caller's voice – great for catching phone numbers from people who rattle them off so fast they must think you have a tape recorder built into your brain. The message-forwarding feature directs messages to a different number (a phone or pager), so you know when new messages arrive.

Message mixmaster.

One disappointment: the surprising mediocrity of the digital sound. Recorded voices are a bit muffled. This is not what CDs have taught us to expect from digital recording. And another drag: it can be complicated to use. For example: "if you want to leave a reminder in my business-call box, you need to press *2 during the message (but before the beep), then leave your name and number after the beep...." Get the message? – *Rebecca Day*

IT-A3000 Integrated Digital Telephone Answering Machine: US$269.95. Sony: (800) 222 7669, +1 (201) 368 9272.

Video Watchdog

This is the one must-have magazine for the video completist. Where else can you get reviews of six different versions of *Blade Runner*, complete with stills and dialog from deleted scenes? Who else is going to go scene-by-scene through David Lynch's script of *Twin Peaks: Fire Walk With Me*, telling you what you're seeing in the context of the other 90 minutes of footage that was edited out?

Video Watchdog's obsessive attention to detail, retitlings, and alternate cuts of movies doesn't end with new films. The editors frequently go back over lost, overlooked, and forgotten gems of the past, such as the little-known *The Magic Voyage of Sinbad* and Fritz Lang's *Journey to the Lost City* (which is really a studio cut-and- paste of two earlier Lang films, *The Tiger of Eschnapur and The Indian Tomb*).

Each issue also has reviews of the latest video and laserdisc releases from around the world. Read up on *Hong Kong* period epics, Turkish Star Trek rip-offs, '50s space operas, and restored musicals. VW isn't for the Blockbuster-Video-never-heard-of-letterboxing crowd. It's for the discerning watchers, the connoisseurs, the collectors who have one foot in this world and the other in the realm of the video-demented.

Video Watchdog: **The movie *otaku*'s bible.**

VW recently published its first Special Edition issue, which starts off with a solid dozen "Best of 1993" lists from obsessive film and video luminaries. You also get lots of strange stuff *VW* couldn't fit into a regular issue! The Special Edition includes the usual info on different cuts and retitlings, plus a look at hot and obscure movie soundtracks, an interview with and exhaustive look at the career of Euro-sexploitation director Walerian Borowczyk, a bio of Kathleen Burke (the sexy Panther Woman from *The Island of Lost Souls*), and some background on Planeta Bur, a little known Russian science fiction film that was acquired by Roger Corman, chopped into pieces, and pasted together to make a couple of US schlock flicks. Plus, info on ordering most of the titles reviewed, great ads, and an index to the whole run of *Video Watchdog*. – *Richard Kadrey*

Video Watchdog: US$24/6 issues. +1 (513) 471 8989, PO Box 5283, Cincinnati, OH 45205-0283.

Travelrama USA

Lots of games claim to be "for all ages." *Travelrama USA* succeeds. Up to four players race each other around the US, collecting postcards randomly assigned from a pool of over 600. The rules are elegantly simple, yet there are enough odd twists and wild cards to make the game play different every time.

Peter Maresca and team have put together an appealing mix of amusingly hokey sound effects, charming postcards (old and new), and graphics in the style of illustrations on paper placemats for roadside diners in the '50s. The result is a fun way to learn all sorts of facts about geography and culture. Where is Monument Valley, anyway? If you aren't sure, you might be able to find it in the handy "album."

I sat down for a quick look at new CD-ROM titles with a group of adults, and two hours later we were still hooked on *Travelrama*. Then I played it with a girl 7 years old, who loved it and wanted to read the information on the back of all the postcards. That a wide range of players can enjoy this game together is no accident.

Adjusting the playing field to fit each player's level of skill is one of the neater tricks computer technology can bring to the social aspect of game design. If I have played the game more often than the people I sit down to play it with, if I am older than they are, or just the kind of guy who memorized every state capital in the fifth grade and still remembers that kind of stuff, I can opt for a "drivers license" while they take a "learners permit." In various subtle ways the game will alter things to give me more of a challenge. Seven-year-old Chloe could peek to see which state she'd have to visit to collect a postcard showing Niagara Falls, but when I tried to do the same with the Buddy Holly Memorial, I found I was on my own.

Travelrama USA: Spin up this CD-ROM and take a road trip.

When she made it back to her home base in Ohio while I was was still some distance from my own starting place in Florida, we both felt she had beaten me fair and square.

As Apple remolds itself into a software company, it could do worse than to produce a lot more titles like this. (p.s. The Buddy Holly Memorial is in north Texas). – *Jim Gasperini*

Travelrama USA for Mac and PC: US$39.95. Zenda Studio: +1 (415) 777 9896.

Better Red Than Spread

Historians will point to alt.ketchup as the high-water mark in Net culture. Where else would H.J. Heinz be worshipped as a god? Where else would anyone wonder why the stuff at McDonald's is so much sweeter than regular Heinz? (It's the extra corn sweetener. Ketchupites order burgers sans ketchup and bring their own bottle of Heinz.)

Woe to the idiot who praises Hunt's on alt.ketchup. The "Mustard People," sworn enemies of the ketchup contingent, are hounded off the newsgroup like the sorry-ass lepers they are: "You should die, infidel! I hope you drown in a vast sea of That-

Please squeeze me.

Which-Is-Most-Red." That was the reply to an audacious predawn attack from a colonel in the Mustard brigade who suggested that Stadium brand mustard was a worthy alternative to ketchup.

The best post I saw recently was a dissertation on why *bottled* ketchup is the ultimate iteration of the Great Red Joy. Since most restaurant-style foil packs of ketchup have drawings of ketchup bottles on them, the conclusion is that foil packs try to invoke the ambiance of bottled ketchup by serving up its image. Don't believe it? Well, have you ever seen a bottle of ketchup sporting a drawing of a *foil pack*? What more evidence do you need? – *Corey Greenberg*

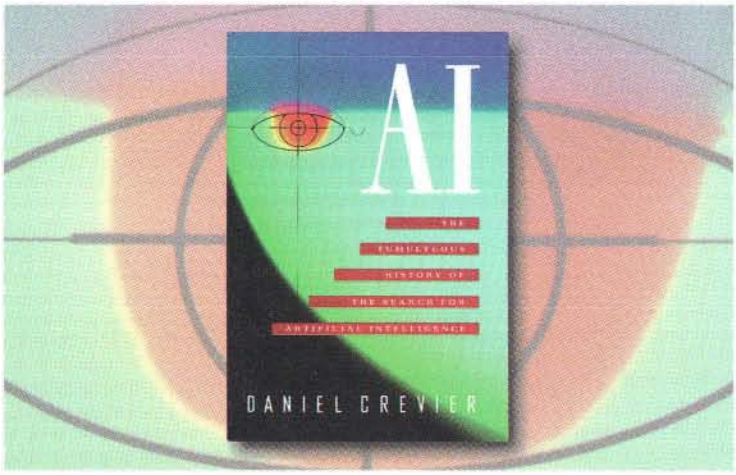
A Smart Look at Artificial Intelligence

Daniel Crevier does a brilliant job of demystifying one of computer science's most misunderstood concepts in his book *AI: The Tumultuous History of the Search for Artificial Intelligence.*

Crevier, a PhD from artificial intelligence hotbed MIT, re-creates the personal disputes, ideological battles, and pervasive grandstanding within the AI community and provides an intriguing look at a discipline that is still suffering from growing pains. In recounting the dialog between conflicting researchers, he describes "lasting grudges and real tooth grinding" and offers anecdotes of scientists booed at debates. Crevier writes in his preface that AI, unlike other sciences, lacks a "sobering influence, and it shows."

In fact, the "characters" are so colorful in this book that one can almost ignore Crevier's concerns that "when machines acquire an intelligence superior to our own, they will be impossible to keep at bay." We may be able to teach machines to think, but can we teach them to be petty, vindictive, and greedy?

His insights are entertaining, as are his detailed accounts of the Sis-



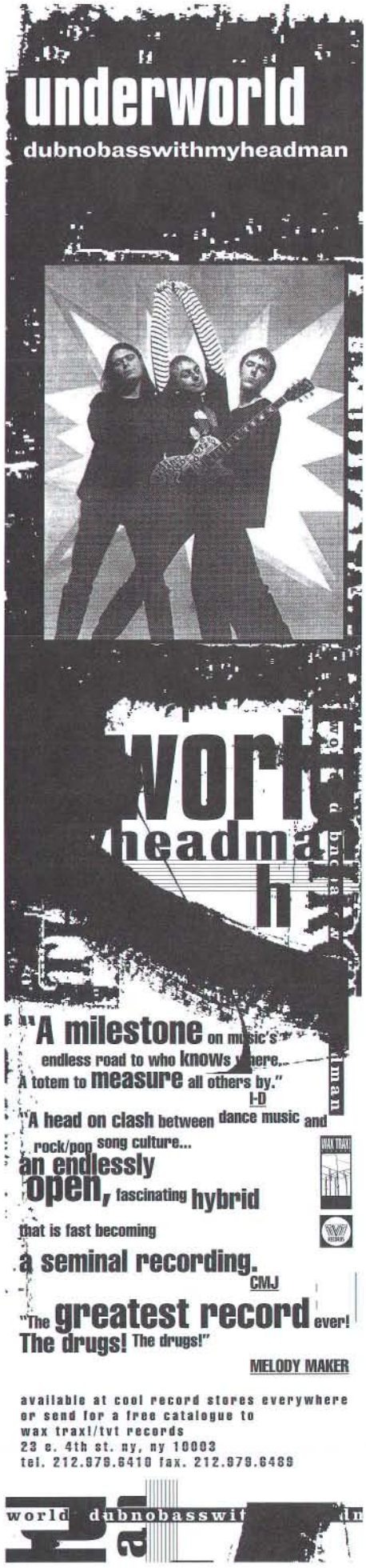
***AI:* The story of the wetware behind the software.**

yphean effort to match the processing power and finesse of the human brain. The reader witnesses firsthand the growth and dormancy of AI several times over, paralleling the staccato advances in computer technology. Crevier includes the various subdisciplines of artificial intelligence, tracking such advancements as computer chess and the marketplace-savvy expert systems. He also lends some commercial experience himself, having founded Coreco Inc. (which uses AI technology to help computers "see" through video cameras). This perspective also helps avoid a dry academic interpretation.

What becomes apparent by the end of the book is that this science has more to do with decoding human thought patterns than it does software and hardware. It is the mystery of that process that locks in your attention. However, as fascinating as artificial intelligence may be, a nonfiction text about it would incite riots of yawning if it were not for the personality of the science deftly drawn by the author.

Perhaps this is anthropomorphism of an anthropomorphic science, but it works. - *Dan Sicko*

AI: The Tumultuous History of the Search for Artificial Intelligence, by Daniel Crevier, US$14. BasicBooks: +1 (212) 207 7057.



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1. Death of PDAs
After the Newton launch, it was immediately obvious that PDAs weren't going to be the overnight success that John Sculley had planned on. Yet most pundits predicted gradual acceptance, and companies from Compaq to AT&T continued with plans to roll out their own PDAs. But, recently, experts' tones have changed. Almost all the vendors have announced cancellations or delays. There are no standards, no software, and, to a large degree, no need. The brightest hope is Motorola's Envoy, but with that company's slim track record in consumer electronics things look real chancy for the next few years.

2. MPEG
Too many people believe the MPEG standard is the answer to all video compression needs, from desktop multimedia to HDTV. What's either forgotten or not realized is that a) MPEG is an extraordinarily loose standard, allowing many incompatible MPEG implementations to exist, and b) what it does standardize limits its uses. Because MPEG is extremely asymmetrical – it takes much longer to compress than decompress – it is good for things like HDTV but bad for interactive applications. There will be plenty of room for other standards which, while perhaps not offering as high compression ratios, offer simpler implementation and more predictable compression times.

	Current Position	Position Last Month	Months on List
Death of PDAs	1	–	1
MPEG	2	–	1
Chicago	3	–	1
Caches	4	–	1
Net backlash	5	1	3

HYPE LIST

3. Chicago
The new version of Microsoft's Windows operating system, currently called Chicago, seems to be in the news more than its municipal namesake. Breathless reports, pushing the edge of non-disclosure agreements, seem to come out daily. What makes this so remarkable is how unremarkable the Chicago OS is. While it rectifies many of the glaring limitations of previous versions (8-character file names, 16-bit operation) it makes no real strides in OS technology. And, if it is anything like other Microsoft releases, it is still chock-full of bugs. When is Microsoft going to use its resources to do something revolutionary?

4. Caches
While the capacity of DRAMs quadruples every three years, the speed of DRAMs – and hence of main memory – only doubles every 10 years. This imbalance is becoming critical with new processors that operate at superfast clock rates. At 150 MHz, almost 40 instructions could be executed in the time it takes for a single memory access. To prevent these stalls, computer architects are turning to increasingly byzantine caches – small amounts of fast (and expensive) memory that store the most commonly needed data. Look for fundamental changes in memory architecture over the next two years.

5. Net backlash
Now that the Net is so mainstream, the truly hip are unplugged, unconnected, and don't use e-mail. At least that's what a spate of recent media articles seem to claim. Perhaps these articles shouldn't be taken too seriously; after all, it's inevitable that what the media hypes relentlessly one month will be denigrated the next. Yet such critiques smack of élitism. While I never expected e-mail to break down hierarchies (as some researchers claimed it would) it is a bit disappointing to see the arrival of the global village greeted by murmurs of disgust about how mindless and perverted most people are.

– Steve G. Steinberg **(hype-list@wired.com)**

Voices from Planet Duplex

When David Greenberger became the activities director at Boston's Duplex Nursing Home in 1979, he wanted a way to get all the cylinders running in the minds of the seniors living there. Shuffleboard just wasn't going to do the trick; instead Greenberger created a 'zine called *Duplex Planet* and began asking the residents all sorts of goofy questions, such as, "Which is better, coffee or meat?" He put their answers (such as, "Can't chew, so it'll have to be coffee") in his 'zine.

Duplex Planet was an underground success, and has since grown to include a weekly radio show, a CD, a comic book, and a set of

trading cards. Now there's a book called *Duplex Planet: Everybody's Asking Who I Was* that features the best of his 'zine.

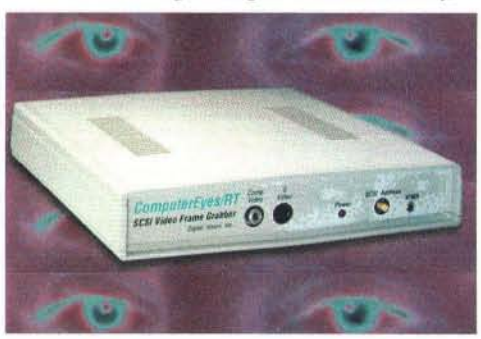
The 'zine has spawned an eclectic mix of admirers - filmmaker Jonathan Demme, illusionists Penn & Teller, musician Lou Reed. It's easy to see why. These interviews are witty, silly, intriguing. While they don't necessarily illustrate the wisdom of years, it's a kicky reminder that it's OK to be outrageous at any age.
– Betsy Brazy

Duplex Planet: Everybody's Asking Who I Was, by David Greenberger, US$14.95. Distributed by Cornell University Press: (800) 666 2211, +1 (607) 277 2211.

ComputerEyes

You can't use full-speed video on a paper document. What you need are *photographs* that will lie still on the page. But a video camera is a great way to capture still images (30 shots a second, faster than a whining motor-driven SLR). ComputerEyes RT lets you grab a frame from your TV or camcorder. It is simpler and cheaper than full video, and it works with portable computers, because it's an external box rather than a plug-in board. I tested a few frame-grabbing products from various manufacturers (I publish a newsletter for model airplane enthusiasts), and this one is one of the best.

The color units, the RT and the Pro, have sparkling S-video input, while the black-and-white box has nearly as good composite inputs, producing pictures that are more than adequate for use in a newsletter or real estate listing. It can grab a frame on the fly,



ComputerEyes: Grab that video image!

so just choose your moment. When playing back (or just playing through the camcorder), you see the action in real time in a little window. The resolution is whatever your camera gives – the ComputerEyes RT box is good for 640x480x24-bit color, better than most video. You can fix all the usual suspects – brightness, contrast, and color parameters – both before and after capture. Once you have pressed the button, you can process the picture with Enhance, ColorIt!, Photoshop (for which they provide a plug-in), or any of the other picturemonger programs.

I used mine with a PowerBook 180, but since ComputerEyes RT is SCSI, it will work with any Mac. My ComputerEyes RT ran so hot I could smell it when I walked into my office, but it didn't fail, and the sales department tells me a cooler chip is in development. – *Jef Raskin*

ComputerEyes RT: US$599. Digital Vision Inc.: (800) 346 0090, +1 (617) 329 5400.

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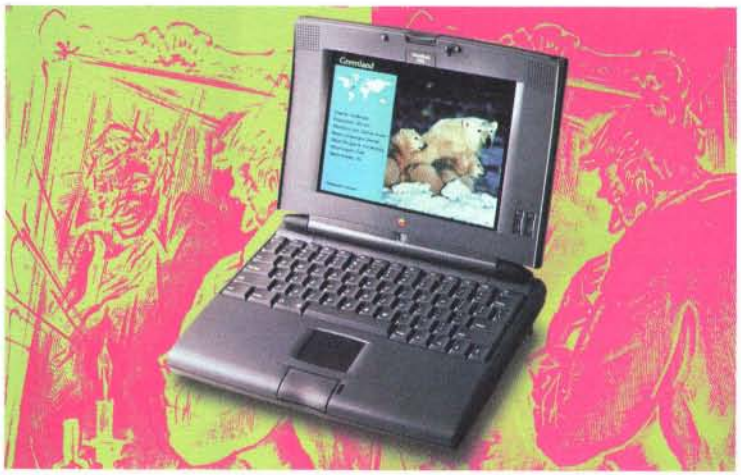
SchizoBook 540c

The 540c, Apple's newest, top-of-the-line color PowerBook, is a good example of schizophrenic design.

I love the speed and the clear screen. The colors are saturated, not the least bit wishy-washy. But I can't run my CAD package because there's no math co-processor. And the curvilinear case? Gimme something that closes more like a box, with no holes or jutting parts. Good, if not spectacular, are the dual batteries that allow you to switch on the fly.

I dislike the screen controls. Instead of instant sliders for brightness and picture quality, there are stupid buttons. Like push-button volume controls, they are harder and slower to use than sliders or knobs, and do not indicate their current setting by their position. In spite of all the supposed interest in making things easier to use, designers somehow insist on sticking these little burrs in our pants.

Bad: still no handle (you gotta carry it like a football). Good: it puts itself to sleep when you close the lid! Like I said, schizoid design, probably a team consisting of a genius and an idiot tossing coins to see who gets to do what.



PowerBook 540c: not quite super, but about as good as portable computing gets.

Are there other nice touches? A zillion of them. And that's part of the problem. There are more than 20 "control panels," each allowing you to adjust some aspect of the hardware or software. It's like one of those old hi-fi systems with a hundred inscrutable dials.

Then there's the track pad. Probably the most controversial innovation, it is a no-moving-part pad that works a bit like a trackball. I like it about as well as the small (but not tiny) trackball on my PowerBook 180, and a lot better than the really tiny trackballs on the Duo series. But I like my big trackball a lot better.

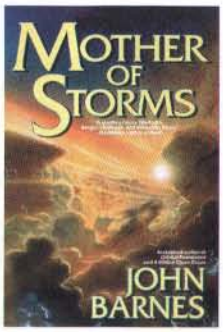
Overall I'd rate Apple's new 540c somewhere between good and super. With built-in Ethernet and a gung-ho 68LC040 in the box, this is one speedy chunk of silicon. I can imagine something much better, but in the real world, this is about as good as portable computing gets. – *Jef Raskin*

Apple PowerBook 540c 12/320/modem: US$5,539. Apple: (800) 538 9696, +1 (408) 996 1010.

Neuromancer Gets a Pot Belly

John Barnes's *Mother of Storms* is a great big romp of a quasi-cyberpunk disaster novel. Imagine that William Gibson's characters grew up, got jobs with the government, and found themselves smack in the middle of *Lucifer's Hammer* or any other vast, sprawling easy-on-the-brain novel about large-scale destruction.

It's great fun and full of amusing and alarming ideas. Barnes plays the sci-fi writer's what-if game very well. What if virtual reality supplants TV? What if the deep ecology movement becomes mainstream? What if countries around the world cede their sovereignty to the UN? What if someone builds a community of robots and they develop their own economic system?



Of course, it's not a perfect book. All of the characters seem to have the same sense of humor, whether heroes or villains. Key plot elements hinge on vital information being transmitted on the Net without security precautions; it's hard to believe that Barnes has never heard of encryption.

At least Barnes is square with you from page one. *Mother of Storms* promises solid middlebrow entertainment, and it delivers. – *Bob Rossney*

Mother of Storms, by John Barnes, US$22.95. TOR/St. Martin's Press: (800) 221 7945, +1 (212) 674 5151.

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Street Cred Contributors

Gene Alloway is an engineering librarian (sans bun) and writer who can't find a decent place to dance.

Patrick Barber wonders what it would sound like if all the cars stopped. He is a writer.

Colin Berry (*cpberry@aol.com*) clutters the pages of *Option*, *Ray Gun*, *SF Weekly*, and the upcoming *Happy Mutant Handbook*.

Betsy Brazy (*BzMouse@aol.com*) is a freelance writer, editor, and quilter who lives in Alameda, California. She judges the quality of a newspaper by its comics; her personal hero is Mighty Mouse.

Andy Eddy (*vidgames@netcom.com*) is senior editor for *GamePro Magazine* and author of the book *Internet After Hours*.

Jim Gasperini, (*jimg@well.sf.ca.us*) author of *Hidden Agenda*, is currently designing multimedia titles for several platforms in Paris and New York.

Corey Greenberg is an Austin, Texas-based writer. His work has appeared in *Rolling Stone*, *Spin*, and *Stereophile*.

Bryan Higgins plays the French horn and clavichord, writes fiction and software, and lives in Berkeley and Soda Springs, California.

Stephen Jacobs (*sxjnce@rit.edu*)teaches for the Applied Computing Technology and English departments at the National Technical Institute of the Deaf.

Richard Kadrey (*kadrey@well.sf.ca.us*) is senior editor at *Future Sex* magazine as well as author of the novels *Metrophage* and the forthcoming *Kamikaze L'Amour*. In 1983, he moved to San Francisco and has been there in the fog ever since.

Sean Manseau is a veteran of several Holiday Inn lounge acts, including Skippy and the Vel-Tones.

Zach Meston (*vgzach@delphi.com*) resides in Hawaii and writes videogame strategy books for a living, a lifestyle combination that makes most people insanely jealous and physically ill.

Charles Platt (*charles@mindvox.phantom.com*) is a science fiction writer and a science writer. His most recent work is *The Silicon Man*. He writes frequently for *Wired*.

Jef Raskin (*raskinjef@aol.com*) created the Macintosh computer project and plays the contrabass recorder in F.

Levi Rizetnikof is a contributor to the legendary *Electric Word*, and is currently surfing for a living in Hanalei, on the island of Kaua'i.

Bob Rossney writes the Online column for the *San Francisco Chronicle* and is still looking for a reason to buy a CD-ROM player.

James Rozzi is a freelance writer, woodwind musician, and teacher in the Orlando, Florida, area.

Rich Santalesa is the former editor in chief of *Windows User* magazine. Currently he's the editor of *PDA & Wireless World*.

Dan Sicko is a programmer/analyst and freelance writer. He *still* does not have the Sci-Fi Channel.

Steve G. Steinberg (*tek@well.sf.ca.us.*) is a computer science student and the editor of *Intertek*, a technology and society journal.

Scott Taves (*staves@aol.com*) is the director of Reactor Sound, a new record label in Chicago. He's partial to machine music.

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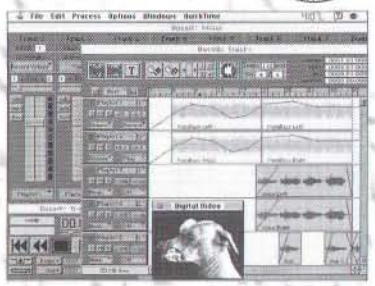

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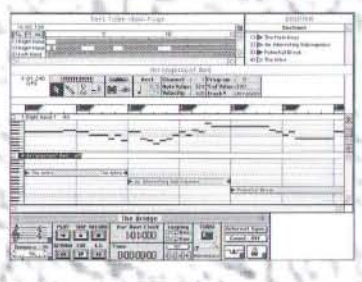

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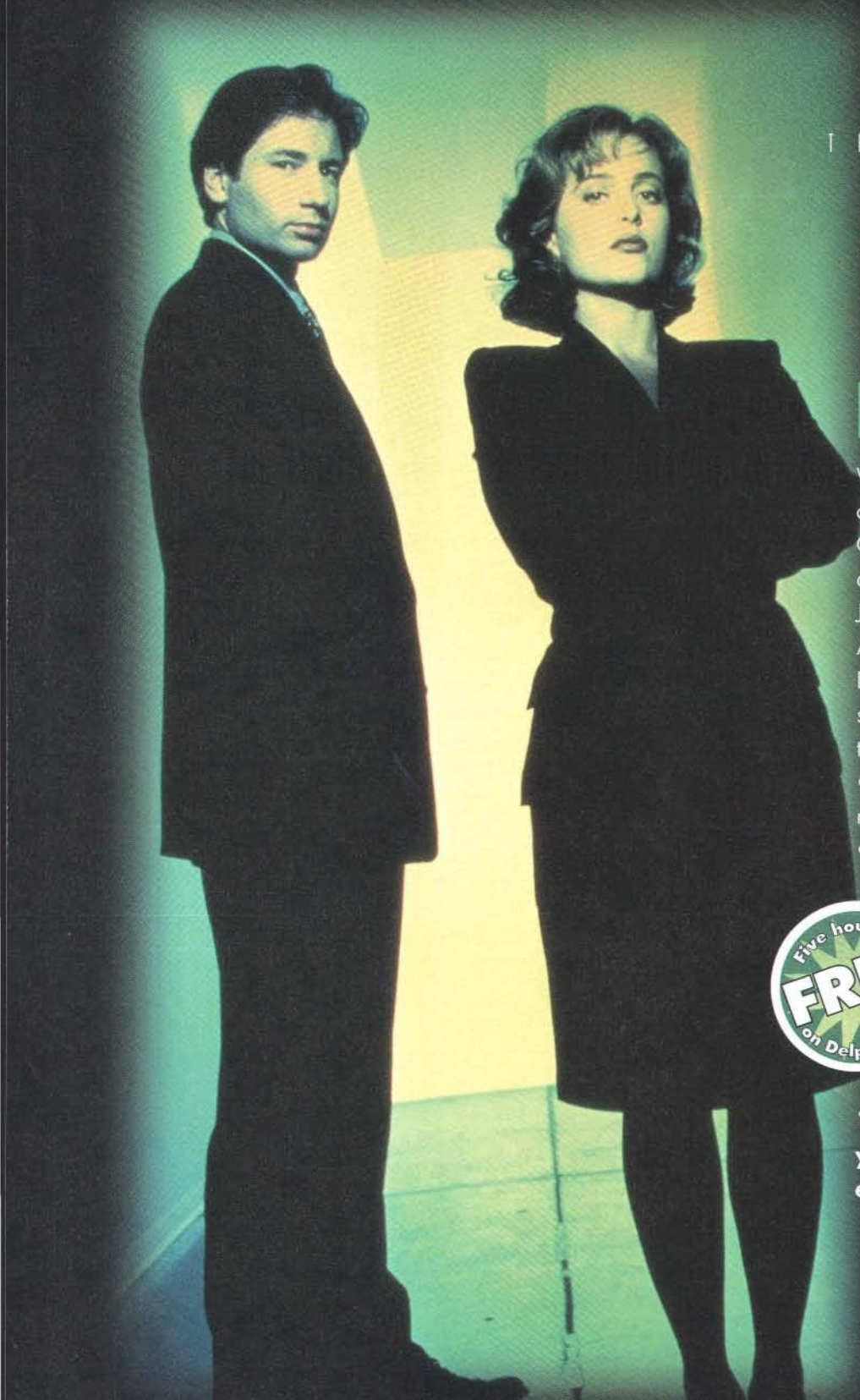

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The Tools of Decentralization

In the Net's DNA there's a dominant gene for decentralization. We've moved from campus mainframes supporting thousands of users to Unix workstations supporting dozens of users to personal computers supporting you alone. Decentralization gives you access to Internet tools the way your operating system intended, plus oodles of configurability via preferences, bookmarks, hotlists, and shortcuts. Decentralization brings liberation.

But decentralization also delivers new responsibilities: you're the only one who can ensure that what you're clicking on is the current version of <insert your favorite navigational aid here>. In the days of centralized computing, when 30 people complained about software gone stale, 3,000 benefited from the upgrade. Not so on your desktop. Nor on your group's workstation.

Imagine *Good Housekeeping* online, giving its seal of approval to Internet tools.

A tentative step in the right direction is the *Clearinghouse for Networked Information Discovery and Retrieval (CNIDR,* pronounced "snyder"), based at North Carolina's Research Triangle Park – an area between Raleigh, Durham, and Chapel Hill. Started with a three-year National Science Foundation seed grant, the CNIDR project works with developers to create compatible and convergent network tools while creating a repository for collecting, evaluating, and distributing them. (Imagine if *Good Housekeeping* were online 24 hours a day, giving its seal of approval to various Internet tools.)

So far, CNIDR has taken a strong interest in freeWAIS, a noncommercial implementation of the WAIS indexing and search tool suite; whois++, a decentralized and distributed scheme for locating information about Internet users; and conferencing tools CU-SeeMe and Maven (see *Wired* 2.09, page 145). Definitive versions, as well as information about CNIDR itself, are available from the CNIDR archives, accessible via *ftp://ftp.cnidr.org,* and *http://www.cnidr.org/welcome.html/*. CNIDR's kindergarten-through-12th-grade materials are available on the Web at *http://k12.cnidr.org/*. If that doesn't satisfy you, you can also send *e-mail* to *info@cnidr.org.*

CNIDR's interests and software archives are a bit quirky, and it may seem behind the times in terms of desktop Internet applications. This is all due, perhaps, to the vision and personality of its director, George Brett II. Brett's model of the Internet – and the CNIDR logo – is the kudzu vine, a plant indigenous to Japan. Left to its own devices, kudzu grows at an incredible rate in favorable climates, drowning states like North Carolina and Georgia in no time. But, when cultivated and cared for, kudzu can be an important ingredient in cattle feed, and a resource useful in weaving and paper making.

To be sure, this is an optimistic and picturesque metaphor for the greening of the Internet. But it's not always clear that Brett believes the Internet can be cultivated when he baffles his listeners with his kudzonic disorganization chart. – *Eric S. Theise* (verve@cyberwerks.com)

Time To Get a Studio

Your sloppy housemate's socks litter the floor like so many odiferous fallen leaves. He has eaten all your food (again), and his share of the rent is nowhere in sight. Put down the gun, and instead vent your frustrations on *alt.flame.roommate*. In this Usenet newsgroup, everyone has a Roommate From Hell story. All the better as you breathe a cathartic sigh of relief and realize that it could be much, much worse – you could be posting to *alt.flame.landlord*.

Check The Basement

The world is moving so fast these days that it can be close to impossible to obtain those out-of-print or hard-to-find titles. *Basement Full of Books*, a list of books directly obtainable from more than 50 authors (including David Brin, Harlan Ellison, Joe Haldeman, Vonda N. McIntyre, and Jane Yolen), puts a small dent in this problem. Put in your request for a personalized, signed copy of your favorite! Simply address your request to the applicable author's snail or e-mail address, which is included in the list. Basement Full of Books is updated monthly. (Information is also given for writers who would like to add their books to the list.) Copies are available on *CompuServe* (in *Library 3* of the *Science Fiction Forum, HOM-9*) and *GEnie* (in the library of SFRT1, page 470, option 3), and by *anonymous ftp* from *rtfm.mit.edu* in directory */ pub / usenet / news.answers / books / basement-full-of-books*. But since only 50 connections are available, you'd better already have a book to read as you try to access this machine. Or, send *e-mail* to *mail-server@rtfm.mit.edu* with *send usenet / news.answers / books / basement-full-of-books* in the body of the message. Happy hunting!

A Penny Saved....

Don your spectacles and delve into this gopher gold mine of Benjamin Franklin arcana. The hint is the unusual port number (notice it's not your conventional gopher 70). What you'll find are two full menu screens – 31 choices in all – dominated by the Poor Richard collection. All (pure text) files reflect Franklin's prodigious output. (Read: they are gargantuan.) The first three files alone, covering his writings in Boston, London, and Paris from 1722 to 1785, take up nearly 1.5 megabytes. The next two, written in Philadelphia between 1726 and 1790, are another meg. History teachers and buffs alike, with access to the Net, will love this site. But you'll want to do more than just burrow to Franklin: this gopher also contains references to 129 books and authors, from Aristotle to Winston Churchill. (Menus are arranged by first name, so Churchill is the last entry, right after William Shakespeare. Go figure.) Investigate *gopher://gopher.vt.edu:10010/11/85* for Ben's words, or *gopher://gopher.vt.edu:10010/10/33* for the whole set. Ben would dig this!

Net Knowbies

Having problems installing your CD-ROM drive? Stuck in *King's Quest VI*? Thanks to Usenet, there is a place that has all the answers – newsgroups *comp.sys.ibm.pc.games.hardware* and *comp.sys.ibm.pc.games*. Since general postings are not recommended, each of these groups is split into subgroups for specific concerns. Installing a new 28,800-baud modem? Post questions to *comp.sys.ibm.pc.hardware.comm*. Rerouting a LAN? Browse through the listings in *comp.sys.ibm.pc.hardware.networking*. Other groups include *comp.sys.ibm.pc.hardware.cdrom, .chips, .misc, .storage, .systems,* and *.video*. Technical service lines were never this easy! Just to prove that life isn't all work and no play, *comp.sys.ibm.pc.games* covers gaming problems ranging from installation difficulties to solutions for puzzles. Desperate to defeat the demons in *Doom*? Access *comp.sys.ibm.pc.games.action*. Ultima VIII's *Pagan* got you peeved? Try *comp.sys.ibm.pc.games.rpg*. Other groups: *.games.adventure, .flight-sim, .misc,* and *.strategic*. It's cheaper than paying 75 cents a minute on a corporate help line, and there's no voicemail system ordering you to press the pound sign or asking you to hold.

Destined To Be a Hit

The HIT Lab (Human Interface Technology Laboratory) at the University of Washington in Seattle is on the cutting edge of virtual exploration. As part of its overall work, it has assembled a Knowledge Base team to better assimilate and make available the lab's informational resources. A direct result of the effort is the quarterly publication *Virtual Reality Update (VRU)*. A bibliographic document, *VRU* offers a long and informative list of citations from magazine, newsletter, and journal articles, as well as videos and conference papers. It also features a section called *On The Net*, which serves up some choice waves for VR intel. You can *GET* a HIT VRU via *anonymous ftp* from *ftp.u.washington.edu* in */public/Virtual Reality / HITL/ Bibliographies / VRU*. Be sure to check in every quarter for the latest developments in virtual reality research.

Extra, Extra, Read All About It

Try waxing your board with the *Netnews Filtering Server* provided by the Database Group at Stanford. This pioneering effort can be accessed by pointing *e-mail* to *netnews@db.stanford.edu*. In the body of the message type *SUBSCRIBE*, followed by your particular interest (i.e.: *zippies, telepresence, clipper chip)*. The database will scan all incoming news (from NetNews) and assign each article a score from 1 to 100, based on a statistical distribution of the words in the article. A periodic mailing will list the first 20 lines of all filtered articles, each article being assigned an ID number which, when combined with a *GET* command, will prompt the server to mail the entire article. Once subscribed to an interest, other available commands include: *PERIOD, THRESHOLD, SEARCH, FEEDBACK, LIKE, LIST, EXPIRE,* and *HELP*. Be careful when diving in: overextending yourself with too many interests can drown you in the deep waters of an overstuffed mailbox.

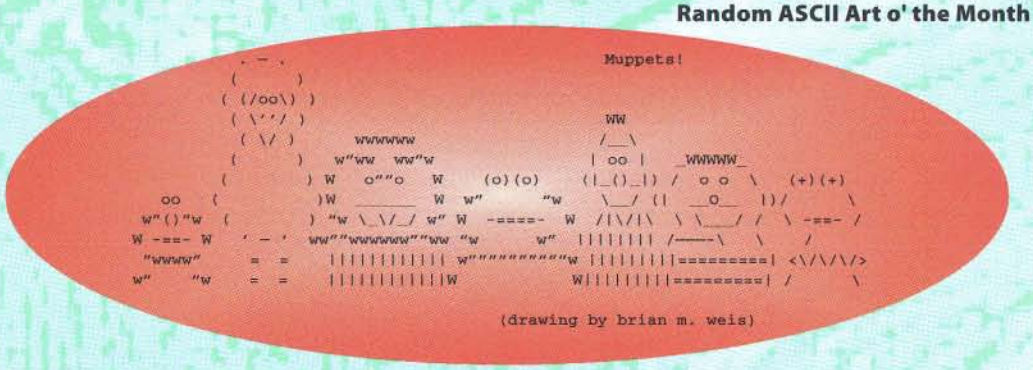
"I Speak Jive...."

Here's just the place to go if you've been having trouble deciphering those mysterious kanji characters you've seen on, say, the cover of a magazine or something. Take a look at Australia's *monu6.cc.monash.edu.au*, in directory *pub/nihongo*, or peek into the North American echo, *ftp.uwtc.washington.edu*, in directory */pub/Japanese/ Jim-Breen* (Jim's the guy who started the EDICT project). Among all the goodies in this archive, you'll find a Japanese-English dictionary file called *edict*. With more than 77,000 entries (and more added with each update), the dictionary is quite usable: reader programs exist to browse through EDICT running on DOS, Windows, Mac, and X Windows machines. And the browsing software is quite advanced, allowing you to look up words in either English or Japanese. *Uso-mitai!*

An Element of Security

At last, a clear statement of what those nine digits on your social security card mean (and they don't mean much) – presented in either English or Spanish to boot! Curious about what the *Social Security Administration* is up to lately? Scrutinize *gopher://gopher.ssa.gov/*. Here, the gamut is covered, from retirement, survivors, and disability benefits, through medicare and food stamps, to statistical data and abstracts. There's even the requisite FAQ (frequently asked questions file). Most noteworthy are the *Fast Facts and Figures* file and the *Statistical Tables* – a potpourri for journalists and data seekers. Burrowing to *The Social Security Handbook*, which points to a directory, will only dump you into an empty hole, so check it out on the Web at *http://www.ssa.gov/*. Beginners should start with the last item on the menu – the FAQ. *E-mail* your comments and questions to Bruce Carter, *bwcarter@ssa.gov*.

Random ASCII Art o' the Month



Who Needs An Agent?

PCTravel, a service provided by the Raleigh, North Carolina-based American Travel Corporation, is the first of its kind to offer no-fee flight and fare data for more than 250 airlines worldwide. PCTravel provides real-time access to The Apollo reservation system, so information is always fresh. The interface is menu-driven in a standard, easy-to-follow format. Talk about one-stop-shopping: connecting your modem *(N-8-1)* to *+1 (919) 831 4848* will allow you to peruse airport information, flight schedules, seat availability, and fares; it even allows you to accrue frequent-flyer miles, or create a personal profile for seat and special meal preferences. Have your major credit card ready – even though you'll never pay for anything but the ticket (which includes overnight ticket delivery and US$100,000 in flight insurance). You can even make rental car arrangements. If you'd like more information or would like to make voice contact with the PCTravel staff, call +1 (919) 831 3800. And please return all trays to their original, upright position.

Thanks to the *Wired* 2.10 Surf Team

JC Herz *mischief@phantom.com*
Jim W. Lai *jwtlai@netcom.com*
John S. Makulowic *verbwork@access.digex.net*
John Reul *johnreul @ aol.com*
Brent Sampson *sampsonb@ucsu.colorado.edu*

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If you're headed to DC for Supercomputing '94

Like Hollywood and Detroit, Washington, DC, is a one-industry city. In DC's case, that industry's politics. Time is measured in congressional sessions and election years. But as Supercomputing '94 attendees will discover, beneath the dry political crust entertainment abounds. For every member of the bar, there is a bartender.

For starters, cruise the once-dilapidated, now-hip U Street Corridor in the NW quarter. For a surreal supper, go to the **Andalusian Dog**, a tapas place straight from Salvador Dali: eyeballs dangle and loaves of bread fly above your head. Wash the flame-roasted peppers down with Andalusian ale.

A few blocks away, in the older neighborhood of Adams Morgan, restaurants of every cuisine line 18th Street NW like dominoes. If you like Ethiopian eats – cheap, hot, no forks – both **Red Sea** and **Meskerem** come highly recommended. The Caribbeanesque **Café Atlántico** offers sumptuous seafood and vegetarian selections. And if you feel like indulging that expense account, try **Nora's** – Al took Tipper there for her birthday.

Come nighttime, jazz junkies should walk on over to **One Step Down**, the best jazz club in the city. Live-music lovers can also check out **Nightclub 9:30**, a DC classic — REM and 10,000 Maniacs played there way back when. Stop by even if you haven't heard of the band, and in a few years you'll be saying, "I saw Velocity Girl back when.... "

Abraham Lincoln's mantra notwithstanding, Washington has developed as much for the Tourists as for the People. It is a city of museums, memorials, and monuments. Unless you have a penchant for long lines and painful decorating, skip the White House tour. The **Vietnam Veterans Memorial**, a black granite wall of names, and the new **US Holocaust Memorial Museum**, however, are required stops around the Mall. But reserve your tickets for the Holocaust Museum well in advance. You can stargaze between conference sessions in the **Albert Einstein Planetarium** at the **National Air and Space Museum,** or feast your eyes on the current IMAX film in the museum's theater. Other Mall mentionables are the angular East Building of the **National Gallery of Art**, designed by I.M. Pei, and James McNeill Whistler's marvelous Peacock Room in the **Freer Gallery of Art**. The often forgotten **Phillips Collection** includes some superb art – look for the whimsical works of Paul Klee.

Now, for the monuments: I know, you went to the **Lincoln Memorial** when you were a kid and thought it was a yawn. Mom made you pose on the steps, and Dad talked about the Civil War. This time, visit the Mall after your former bedtime – the white marble monuments loom eloquently in the darkness.

Sick of supercomputing? Disappear into the formal gardens of **Dumbarton Oaks**, an 18th-century estate bordering Georgetown. This is the best-kept secret in Washington. Well, the best-kept non-political secret, at least. To hear the *real* Washington secrets you'll have to hang out in the locker room of the **Washington Sports Club**, the favorite of politicians and pundits alike. – *Jessie Scanlon*

Capital thank-yous to Dana Singiser, Pat Kowalzzyc, and restaurant maven Dennis Thompson. Pints of appreciation to Jantje Boichel.

DEDUCTIBLE JUNKETS

October 22-26
ACM Conference on Computer Supported Cooperative Work; Chapel Hill, North Carolina
CSCW '94 sessions will mull over "Transcending Boundaries – People, Places and Times" and consider how computer-supported environments enable us to transcend boundaries through efficient office information systems and collaborative networks. Noteworthy CSCW systems will be highlighted at an evening of special demonstrations. Registration fee is US$475 (students $150) before September 6, $565 thereafter. Tutorials not included. Contact: CSCW '94 office, phone +1 (919) 962 1869, fax +1 (919) 962 1799, e-mail *cscw94@cs.unc.edu*, World Wide Web *http://www.cs.unc.edu/home.html*.

November 2-4
UIST '94; Marina Del Rey, California
The Seventh Annual Symposium on User Interface Software and Technology will be a small, focused gathering of user-interface researchers and practitioners. UIST '94 will feature informal demos at which attendees can "test drive" various systems. Registration fee is US$490, students $165. Contact: Pedro Szekely, phone +1 (310) 822 1511, fax +1 (310) 823 6714, e-mail *szekely@quark.isi.edu*, World Wide Web *http://www.gatech.edu/gvu/UIST94/uist94top.html*.

November 4-6
Doors of Perception; Amsterdam
Home is where you hang your hat. Or is it? The second Doors of Perception conference, sponsored by the Dutch Design Institute and *Mediamatic* magazine, will explore the idea of "home" in the context of our ever-more-computerized and networked world. Sessions will cover everything from psycho ergonomics to virtual real estate. But there are only 1,200 seats, so register early or you won't only be thinking about home, you'll be there. Amsterdam is lovely in November (bring a raincoat). Registration fee around US$400. Contact: phone +31 (20) 61 70 390, fax +31 (20) 61 74 679, e-mail *home@mediamatic.hacktic.nl*.

November 14-18
Supercomputing '94; Washington, DC
"Are supercomputers dead?" These guys don't think so. SC '94 will focus on supercomputing research, with plenary sessions devoted to its applications in biology and medicine, environmental work, and manufacturing and design. Highlights include the keynote address by Ed McCracken, chair and CEO of Silicon Graphics Inc., and a speech by NASA researcher Michael George on the important work being done with experimental wind tunnels. Registration for the technical program is US$495, students $90. Fee for the tutorial is $490, students $105, but prices are lower if you register before October 14. Contact: +1 (515) 294 0673, fax +1 (515) 294 0888, e-mail *info@sc94.ameslab.gov*.

November 14-18
Comdex/Fall '94; Las Vegas
If you've been to Comdex then there's nothing more to say. If you haven't, well ... Comdex is a Dionysian fest of information technology products and people. Nearly 200,000 people, actually. The conference will be broken down into 27 programs grouped into five topic areas: desktop computing, connectivity, new media, development, and the marketplace. Registration is US$550 for full conference, one- and two-day passes available. Contact: phone +1 (617) 449 8938, fax +1 (617) 449-2674.

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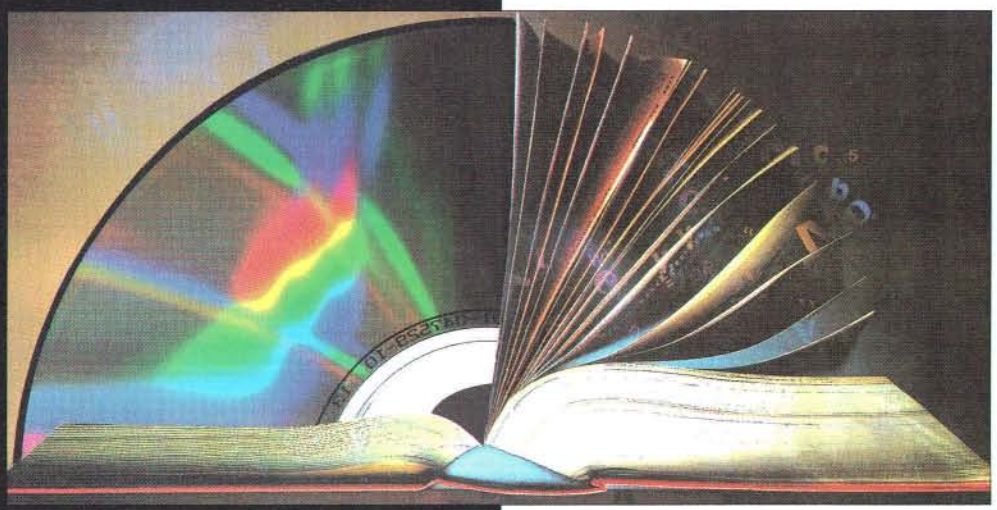

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SPEW

AFTER CAREFUL ANALYSIS OF INSTANT REPLAYS, I EVERYONE. THE TYPE OF GIRL WHO SHOULD HAVE

◄95 just what I need, for the most important assignment of my career to turn into a nookie hunt. I try to drive it from my mind, try to lose myself in the high-definition Spew terminals in the subway car, up there where the roach motel placards used to be. They click from one Feed to another following some irrational pattern and I wonder who has the job of surfing the channels in the subway; maybe it's what I'll be doing for a living, a week from now.

Just before the train pulls into your stop, the terminal in my face surfs into episode #2489 of *Hee Haw*. It's a skit. The banjo picker is playing a bit part, sitting on a bale of hay in the back of a pickup truck – chewing on a stalk of grass, surprisingly enough. His job is to laugh along with the cheesy jokes but he's just a banjo picker, not an actor, he doesn't know the drill, he can't keep himself from looking at the camera – looking at me. I notice for the first time that his irises are different colors. I turn up the collar on my jacket as I detrain, feeling those creepy eyes on my neck.

I have already discovered much about the infrastructure of your life that is probably hidden even from you, including your position in the food chain, which is as follows: the SRVX group is the largest *zaibatsu* in the services industry. They own five different hotel networks, of which Hospicor is the second-largest but only the fourth most profitable. Hospicor hotels are arranged in tiers: at the bottom we have Catchawink, which is human coin lockers in airports, everything covered in a plastic sheet that comes off a huge roll, like sleeping inside a giant, loose-fitting condom. Then we have Mom's Sleep Inn, a chain of motels catering to truckers and homeless migrants; The Family Room, currently getting its ass kicked by Holiday Inn; Kensington Place, going for that all-important biz traveler; and Imperion Preferred Resorts.

I see that you work for the Kensington Place Columbus Circle Hotel, which is too far from the park and too viewless to be an Imperion Preferred, even though it's in a very nice old building. So you are, to be specific, a desk clerk and you work the evening shift there.

I approach the entrance to the hotel at 8:05 p.m., long-jumping across vast reservoirs of gray-brown slush and blowing off the young men who want to change my money into Hong Kong dollars. The doorman is too busy tapping a fresh Camel on his wrist bone to open the door for me so I do it myself.

The lobby looks a little weird because I've only seen it on TV, through that security camera up there in the corner, with its distorting wide-angle lens, which feeds directly into the Spew, of course. I'm all turned around for a moment, doing sort of a drunken pirouette in the middle of the lobby, and finally I get my bearings and establish missile lock on You, standing behind the reception desk with Evan, your goatee-sporting colleague, both of you looking dorky (as I'm sure you'd be the first to assert) in your navy blue Kensington Place uniforms, which would border on dignified if not for the maroon piping and pseudo-brass name tags.

For long minutes I stand more or less like an idiot right there under the big chandelier, watching you giving the business to some poor sap of a guest. I am too stunned to move because something big and heavy is going upside my head. Not sure exactly what.

But it feels like the Big L. And I don't just mean Lust, though it is present.

The guest is approaching tears because the fridge in her room is broken and she has some kind of medicine that has to be kept cold or else she won't wake up tomorrow morning.

No it's worse than that, there's no fridge in her room *at all.*

Evan suggests that the woman leave the medicine outside on her windowsill overnight. It is a priceless moment, I feel like holding up a big card with 9.8 written on it. Some of my all-time fave Television Moments have been on surveillance TV, moments like this one, but it takes patience. You have to wait for it. Usually, at a Kensington Place you don't have to wait for long.

As I have been watching Evan and you on the Stalker Channel the past couple of days, I have been trying to figure out if the two of you have a thing going. It's hard because the camera doesn't give me audio, I have to work it out from body language. And after careful analysis of instant replays, I suspect you of being one of those dangerous types who innocently give good body language to everyone. The type of girl who should have someone walking 10 paces in front of her with a red flashing light and a clanging bell. Just my type.

The woman storms out in tears, wailing

SUSPECT YOU OF BEING ONE OF THOSE DANGEROUS TYPES WHO INNOCENTLY GIVE GOOD BODY LANGUAGE TO SOMEONE WALKING TO PACES IN FRONT OF HER WITH A RED FLASHING LIGHT AND A CLANGING BELL.

something about lawyers. I resist the urge to applaud and stand there for a minute or so, waiting to be greeted. You and Evan ignore me. I approach the desk. I clear my throat. I come right up to the desk and put my bag down on the counter right there and sigh very loudly. Evan is poking randomly at the computer and you are misfiling thousands of tiny little oaktag cards, the color of old bananas, in a small wooden drawer.

I inhale and open my mouth to say *excuse me*, but Evan cuts me off: "Customerrrrzz . . . gotta love 'em."

You grin wickedly and give him a nice flirty conspiratorial look. No one has looked at me yet. That's OK. I recognize your technique from the surveillance camera: good clerk, bad clerk.

"Reservation for Stark," I say.

"Stark," Evan says, and rolls it around in his head for a minute or so, unwilling to proceed until he has deconstructed my name. "That's German for 'strong,' right?"

"It's German for 'naked,' " I say.

Evan drops his gaze to the computer screen, defeated and temporarily humble. You laugh and glance up at me for the first time. What do you see? You see a guy who looks pretty much like the guys you hang out with.

I shove the sleeves of my ratty sweater up to the elbows and rest one forearm across the counter. The tattoo stands out vividly against my spudlike flesh, and in my peripheral I can see your eyes glance up for a moment, taking in the black rectangle, the skull, the crossed fish. Then I pretend to get self-conscious. I step back and pull my sleeve down again – don't want you to see that the tattoo is only about a day old.

"No reservation for Stark," Evan says, right on cue. I'm cool, I'm expecting this; they lose all of the reservations.

"Dash these computers," I say. "You have any empty rooms?"

"Just a suite. And a couple of economy rooms," he says, issuing a double challenge: do I have the bucks for the former or the moxie for the latter?

"I'll take one of the economy rooms," I say.

"You sure?"

"HIV-positive."

Evan shrugs, the hotel clerk's equivalent of issuing a 20-page legal disclaimer, and prods the computer, which is good enough to spit out a keycard, freshly imprinted with a random code. It's also spewing bits upstairs to the computer lock on my door, telling it that I'm cool, I'm to be let in.

"Would you like someone to show you up?" Evan says, glancing in mock surprise around the lobby, which is of course devoid of bellhops. I respond in the only way possible: chuckle darkly – *good one, Ev!* – and hump my own bag.

My room's lone window looks out on a narrow well somewhere between an air shaft and a garbage chute in size and function. Patches of the shag carpet have fused into mysterious crust formations, and in the corners of the bathroom, pubic hairs have formed into gnarled drifts. There is a Robobar in the corner but the door can only be opened halfway because it runs into the radiator, a 12-ton cast-iron model that, random-

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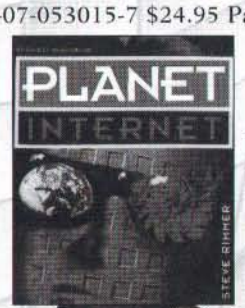

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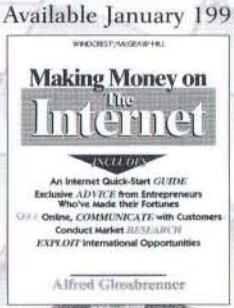

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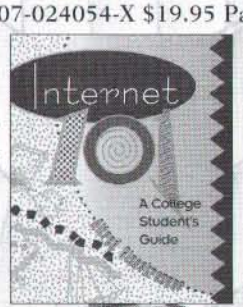

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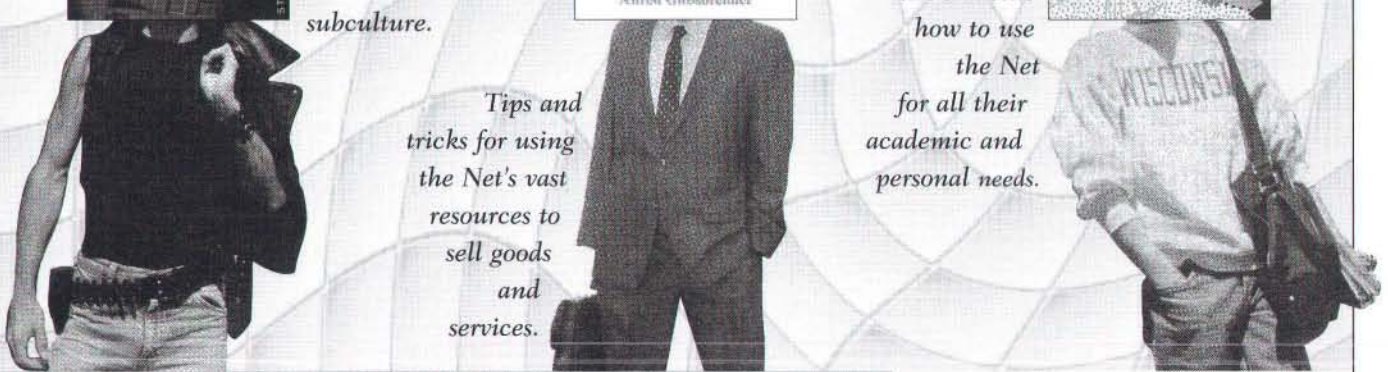

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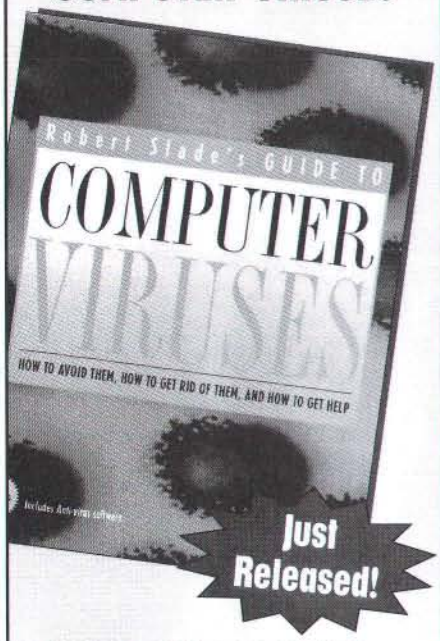

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◂ 143 ly, once or twice an hour, makes a noise like a rock hitting the windshield. The Robobar is mostly empty but I wriggle one arm into it and yank out a canned Mai Tai, knowing that the selection will show up instantaneously on the computer screens below, where you and Evan will derive fleeting amusement from my offbeat tastes.

Yes, now we are surveiling each other. I open my suitcase and take my own Spew terminal out of its case, unplug the room's set and jack my own into the socket. Then I start opening windows: first, in the upper left, you and Evan in wide-angle black-and-white. Then an episode of *Starsky and Hutch* that I happened to notice. Starsky's hair is very big in this one. And then I open a data window too and patch it into the feed coming out of your terminal down there at the desk.

Profile Auditors can do this because data security on the Spew is a joke. It was deliberately made a joke by the Government so that they, and we, and anyone else with a Radio Shack charge card and a trade school diploma, can snoop on anyone.

I sit back on the bed and sip my execrable Mai Tai from its heavy, rusty can and watch *Starsky and Hutch*. Every so often there's some activity at the desk and I watch you and Evan for a minute. When Evan uses his terminal, lines of ASCII text scroll up my data window. I cannot help noticing that when Evan isn't actively slacking he can type at a burst speed in excess of 200 words per minute.

From *Starsky and Hutch* I surf to an *L.A. Law* rerun and then to *Larry King Live*. There's local news, then Dave comes on, and about the time he's doing his Top Ten list, I see activity at the desk.

It is a young gentleman with hair way down past the epaulets of his tremendously oversized black wool overcoat. Naked hairy legs protrude below the coat and are socketed into large, ratty old basketball shoes. He is carrying, not a garment bag, but a guitar.

For the first time all night, you and Evan show actual hospitality. Evan does some punching on his computer, and monitoring the codes I can see that the guitarist is being checked into a room.

Into my room. Not the one I'm in, but the one I'm supposed to be in. Number 707. I pull out the fax that Marie at Kensington Place Worldwide Reservation Command sent to me yesterday, just to double-check.

Sure enough, the guitarist is being checked into my room. Not only that – Evan's checking him in *under my name.*

I go out into the streets of the city. You and Evan pretend to ignore me, but I can see you following me with your eyes as I circumvent the doorman, who is planted like a dead *ficus benjamina* before the exit, and throw my shoulder against the sullen bulk of the revolving door. It has commenced snowing for the 11th time today. I walk cross-town to Television City and have a drink in a bar there, a real Profile Auditor hangout, the kind of joint where I'm proud to be seen. When I get back to the hotel, the shift has changed, you and Evan have apparently stalked off into the rapidly developing blizzard, and the only person there is the night clerk.

I stand there for 10 minutes or so while she winds down a rather involved, multi-threaded conversation with a friend in Ireland. "Stark," I say, as she's hanging up, "Room 707. Left my keycard in the room."

She doesn't even ask to see ID, just makes up another keycard for me. Bad service has its charms. But I cruise past the seventh floor and go on up to my own cell because I want to do this right.

I jack into the Spew. I check out what's going on in Room 707.

First thing I look at is the Robobar transcript. Whoever's in there has already gone through four beers and two non-sparkling mineral waters. And one bad Mai Tai.

Guess I'm a trendsetter here. A hunch thuds into my cortex. I pop a beer from my own Robobar and rewind the lobby security tape to midnight.

You and Evan hand over the helm to the Irish girl. Then, like Picard and Riker on their way to Ten Forward after a long day of sensitive negotiations, you head straight for Elevator Three, the only one that seems to be hooked up. So I check out the elevator activity transcript too – not to be monotonous or anything, but it's all on the Spew – and sho nuff, it seems that you and Evan went straight to the seventh floor. You're in there, I realize, with your guitar-player bud who wears shorts in the middle of the winter, and you're drinking bad beer and Mai Tais from my Robobar.

I monitor the Spew traffic to Room 707. You did some random surfing like anyone else, sort of as foreplay, but since then you've just been hoovering up gigabyte after gigabyte of encrypted data.

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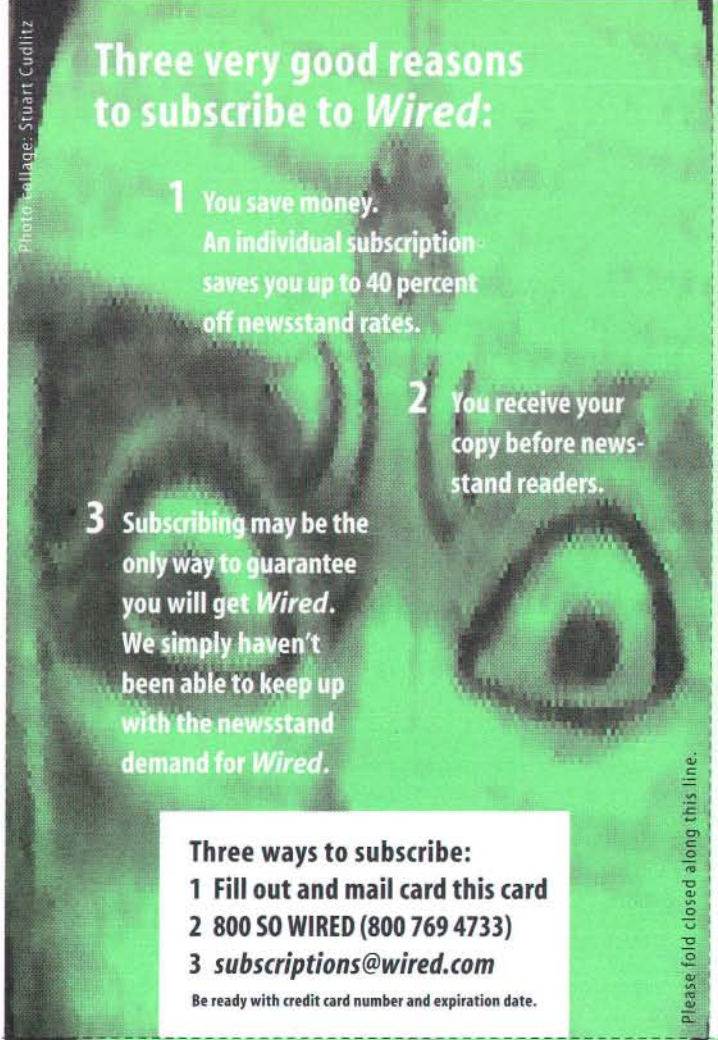

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BUD WHO WEARS SHORTS IN THE MIDDLE OF THE WINTER, AND YOU'RE DRINKING BAD BEER AND MAI TAIS FROM YOU'VE BEEN HOOVERING UP GIGABYTE AFTER GIGABYTE OF ENCRYPTED DATA. ONLY MEDIA TAKES THAT MANY BYTES.

It's gotta be media; only media takes that many bytes. It's coming from an unknown source, definitely not the big centralized Spew nodes – but it's been forwarded six ways from Sunday, it's been bounced off Indian military satellites, divided into tiny chunks, disguised as credit card authorizations, rerouted through manual telephone exchanges in Nigeria, reassembled in pirated insurance-company databases in the Netherlands. Upshot: I'll never trace it back to its source, or sources.

What is 10 times as weird: *you're putting data out.* You're talking *back* to the Spew. You have turned your room – *my* room – into a *broadcast station.* For all I know, you've got a *live studio audience* packed in there with you.

All of your outgoing stuff is encrypted too.

Now. My rig has some badass code-breaking stuff built into it, Profile Auditor warez, but all of it just bounces off. You guys are cypherpunks, or at least you know some. You're using codes so tough they're illegal. Conclusion: you're talking to other people – other people like you – probably squatting in other Kensington Place hotel rooms all over the world at this moment.

Everything's falling into place. No wonder Kensington Place has such legendarily shitty service. No wonder it's so unprofitable. The whole chain has been infiltrated.

And what's really brilliant is that all the weird shit you're pulling off the Spew, all the hooch you're pulling out of my Robobar, is going to end up tacked onto my Profile, while you end up looking infuriatingly normal.

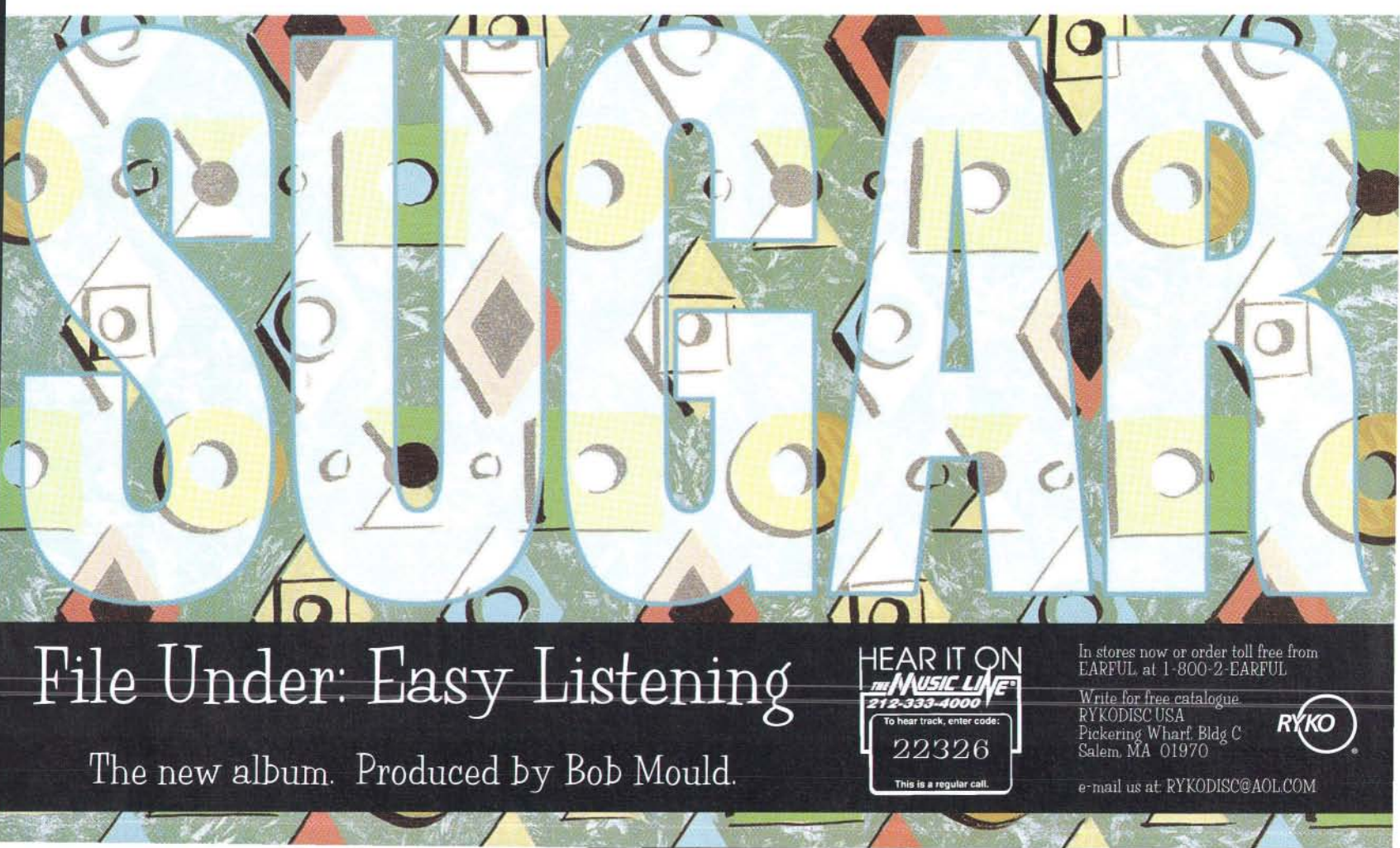
I kind of like it. So I invest another half-hour of my life waiting for an elevator, take it down to the lobby, go out to a 24-hour mart around the corner and buy two six-packs – one of the fashionable downmarket swill that you are drinking and one of your brand of mineral water. I can tell you're cool because your water costs more than your beer.

Ten minutes later I'm standing in front of 707, sweating like a high school kid in a cheesy tuxedo on prom night. After a few minutes the sheer patheticity of this little scene starts to embarrass me and so I tuck a six under my arm and swipe my card through the slot. The little green light winks at me knowingly. I shoulder through the door saying, "Honey, I'm home!"

No response. I have to negotiate a narrow corridor past the bath and closets before I can see into the room proper. I step out with what I hope is a non-creepy smile. Something wet and warm sprays into my face. It trickles into my mouth. It's on the savory side.

The room's got like 10 feet of open floor space that you have increased to 15 by stacking the furniture in the bathroom. In the midst of this is the guitar dude, stripped to his colorful knee-length shorts. He is playing his ax, but it's not plugged into anything. I can hear some melodious plinks, but the squelch of his fingers on the strings, the thud of calluses on the fingerboard almost drown out the notes.

He sweats hard, even though the windows are open and cold air is blowing into the room, the blinds running with condensation



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SPEW

◂ 145 and whacking crazily against the leaky aluminum window frame. As he works through his solo, sighing and grunting with effort, his fingers drumming their way higher and higher up the fingerboard, he swings his head back and forth and his hair whips around, broadcasting sweat. He's wearing dark shades.

Evan is perched like an arboreal primate on top of the room's Spew terminal, which is fixed to the wall at about head level. His legs are spread wide apart to expose the screen, against which crash waves of black-and-white static. The motherly warmth of the cathode-ray tube is, I guess, permeating his buttocks.

On his lap is just about the bitchingest media processor I have ever seen, and judging from the heavy cables exploding out of the back it looks like he's got it crammed with deadly expansion cards. He's wearing dark shades too, just like the guitarist's; but now I see they aren't shades, they are VR rigs, pretty good ones actually. Evan is also wearing a pair of Datagloves. His hands and fingers are constantly moving. Sometimes he makes typing motions, sometimes he reaches out and grabs imaginary things and moves them around, sometimes he points his index finger and navigates through virtual space, sometimes he riffs in some kind of sign language.

You – you are mostly in the airspace above the bed, touching down frequently, using it as trampoline and safety net. Every 3-year-old bouncing illicitly on her bed probably aspires to your level of intensity. You've got the VR rig too, you've got the Datagloves, you've got Velcro bands around your wrists, elbows, waist, knees, and ankles, tracking the position of every part of your body in three-dimensional space. Other than that, you have stripped down to voluminous plaid boxer shorts and a generously sized tank-top undershirt.

You are rocking out. I have never seen anyone dance like this. You have churned the bedspread and pillows into sufferin' succotash. They get in your way so you kick them vindictively off the bed and get down again, boogieing so hard I can't believe you haven't flown off the bed yet. Your undershirt is drenched. You are breathing hard and steady and in sync with the rhythm, which I cannot hear but can infer.

I can't help looking. There's the SPAWN TILL YOU DIE tattoo. And there on the other breast is something else. I walk into the room for a better look, taking in a huge whiff of perfume and sweat and beer. The second tattoo consists of small but neat navy-blue script, like that of names embroidered on bowling shirts, reading, HACK THE SPEW.

It's not too hard to trace the connections. A wire coils out of the guitar, runs across the floor, and jumps up to jack into Evan's badass media processor. You have a wireless rig hanging on your waist and the receiver is likewise patched into Evan's machine. And Evan's output port, then, is jacked straight into the room's Spew socket.

I am ashamed to notice that the Profile Auditor 1 part of my brain is thinking that this weird little mime fest has UNEXPLOITED MARKET NICHE – ORDER NOW! superimposed all over it in flashing yellow block letters.

Evan gets so into his solo that he sinks unsteadily to his knees and nearly falls over. He's leaning way back, stomach muscles knotting up, his wet hair dangling back and picking up detritus from the carpet as he swings his head back and forth.

This whole setup is depressingly familiar: it is just like high school, when I had a crush on some girl, and even though I was in the same room with her, breathing the same air, sharing the same space, she didn't know I existed; she had her own network of friends, all grooving on some frequency I couldn't pick up, existing on another plane that I couldn't even see.

There's a note on the dresser, scrawled on hotel stationery with a dried-up hotel ballpoint. WELCOME CHAZ, it says, JACK IN AND JOIN US! followed by 10 lines of stuff like:

A073 49D2 CD01 7813 000F B09B 323A E040

which are obviously an encryption key, written in the hexadecimal system beloved of hackers. It is the key to whatever plane you and your buds are on at the moment.

But I am not Chaz.

I open the desk drawer to reveal the room's fax machine, a special Kensington Place feature that Marie extolled to me most tediously. I put the note into it and punch the Copy key, shove the copy into my pocket when it's finished and leave the note where I found it. I leave the two six-packs on the dresser as a ritual sacrifice, and slink out of the room, not looking back. An elevator is coming up toward me, L M 2 3 4 5 6 and then DING and the doors open, and out steps a slacker who can only be Chaz, thousands of snowflakes caught in his hair, glinting in the light like he's just stepped out of the Land of Faerie. He's got kind of a peculiar expression on his face as he steps out of the elevator, and as we trade places, and I punch the button for the lobby, I recognize it: Chaz is happy. Happier than me. ■ ■ ■

Canon

◂ 99 sorted to an unorthodox approach. "We tried to tap into the venture spirit, which we don't have in Japan," he says. "We recruited people who had done venture businesses before – and there are many of those, who have become millionaires before the age of 40. I tried to persuade them to work again, not for the money, but for the challenge."

However unorthodox his starting point, Mitarai's next step was typically Japanese – he asked John Linvill, his old professor at Stanford, to recommend someone suitable. Linvill came up with the names of two of his former PhD students, Harry Garland and Roger Melen. The chance to develop real products in a supportive environment was too good for any self-respecting engineer to resist. In looking for a suitable target for their energies, Garland and Melen hit upon the barrier that separates text in image form – e.g., fax – from text in ASCII form. While the latter can conveniently be searched by computer, the former can't.

To take on one of America's most successful companies was an extraordinarily bold decision for a small Japanese firm to make. Breaking the Xerox monopoly on copiers took Canon six years, but the company did it.

They investigated optical character readers and discovered the low accuracy of such systems – typically, between 96 and 98 percent. Using a software model, the center has developed a prototype system capable of recognizing characters with an accuracy of 99.999 percent, or one error every 50 pages. The system is currently undergoing field tests to elicit feedback from customers.

Trying Once More in Computers

A huge success in computer peripherals, Canon's dissident strategy has repeatedly bombed in computers themselves. But, as Mitarai points out, at least the failures have been honorable ones. "We're always trying," he says. "Not for the mediocre, but for something different, something interesting." The company's first shot at the personal computer market was the Cat, launched in 1987. This was a machine designed by Jef Raskin, one of the parents of the Apple Macintosh. The Cat's most distinctive feature was two "Leap" keys in front of its space bar, to enable rapid document searches. But the machine was mismarketed – it was priced at $1,495 instead of the $795 originally planned – then hastily canceled. Raskin suggests that a possible explanation for the Cat's sudden demise was that his old nemesis Steve Jobs (another parent of the Macintosh) refused to let Canon in on NeXT unless they dropped Raskin. The company's next effort was the home-grown Navi (marketed in the US as the Navigator), launched in 1989. This was an ambitious attempt to combine an entire set of office machines – fax, phone, answering machine, and printer – into a single desktop device. But the Navi was ahead of its time, and once again Canon was let down by poor marketing.

Then came the involvement with NeXT. Canon and Steve Jobs had known each other since the early '80s, when Apple decided to source Canon print engines for the Apple LaserWriter. Canon would also provide the printer for the NeXT cube, as well as that machine's most controversial feature, its recordable magneto-optical disk drive.

The Japanese were evidently dazzled by Jobs (as, of course, were plenty of others, including Ross Perot). When NeXT needed money, Canon handed over $100 million without hesitation. This would be followed by further injections of cash – estimates of the total range as high as $200 million. Given the return on investment – NeXT eventually quit the workstation market to concentrate on developing software – you might expect Canon to be bitter about the experience. In fact, Mitarai is philosophical, but determined not to make the same mistake again. "As far as the NeXT venture was concerned," he says, "we just supplied money, we were not participants." Canon's latest foray into computers is a Silicon Valley-based start-up called PowerHouse, a regrouping of NeXT's hardware design team. This time, in addition to $11 million in seed capital, Canon is also sending its own engineers to learn the technology. "If you lose money in real estate, nothing remains," muses Mitarai. "But in computers, even if you fail, you acquire something: whatever experience our engineers go through remains with them, so they can go on to the next thing." ■ ■ ■

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Case Study

◂99 out that Starkweather's machine was the ideal solution for a problem that another PARC luminary, Alan Kay, was having: how to print out from a screen data that was driven by images rather than characters. In early 1971, Starkweather moved to the West Coast, put a prototype together, and by that fall, the world's first laser printer was cranking out a page a second at a 500-dpi resolution. "The machine worked beyond anyone's dreams," says Starkweather. But this was long before personal computers, and Xerox could not envisage anyone wanting printers in their offices.

Six thousand miles away, Takashi Kitamura, an applied physicist who had recently returned to Tokyo from two years of research on image processing at MIT, was not troubled by questions of markets. All he knew was that his company, Canon, was looking for new businesses to tap. With the computer market growing 25 percent to 30 percent annually, computer peripherals seemed like a good bet.

Kitamura and his engineers built a prototype laser printer engine, but Canon had neither the experience nor the cash to go any further. In 1975, the company rented a small booth at that year's National Computer Conference. There Canon's prototype was spotted by none other than William Hewlett himself, at that time still Hewlett-Packard's CEO. The Palo Alto-based company licensed the Japanese technology for its first foray into laser printers, a $100,000 kludge designed to connect to Hewlett-Packard's proprietary minicomputers. Hewlett-Packard didn't sell many of these early units, but they learned a lot about laser printers.

Meanwhile, Kitamura and company concentrated on making the engines small. Once again, they were able to crib from their colleagues in the copier division. In particular, they borrowed the cartridge originally developed for Canon's personal copier, introduced in 1982.

The cheap, replaceable drum that the cartridge contained was the solution to the reliability problem that bedeviled copiers and their offspring. The Japanese flew the cartridge-based engine over to Boise to show the folks at Hewlett-Packard. For a manager by the name of Dick Hackborn, it was love at first sight. "I remember Hackborn saw the engine and immediately said 'I want it,'" says Steve Simpson, general manager of Hewlett-Packard's Boise printer division, about his former boss. (Hackborn retired from Hewlett-Packard last year.) "He saw the opportunity that we might have, though nobody perceived how big that opportunity might grow to be."

The announcement of HP's LaserJet in early 1983 set other minds thinking about laser printers. With the Mac more or less under control, Apple Computer's Steve Jobs and his director of engineering, Bob Belleville, were tossing around ideas about what to do next. The way Belleville recalls it, "Steve said, 'What shall we do?' And I said, 'I want to build a laser printer,' and he said, 'That sounds like fun – what would a laser printer look like?'" Because Belleville had been at PARC, he was able to answer that question.

So, next time the pair went to Japan, they met and negotiated a deal with Canon. Jobs discovered what John Warnock and Chuck Geschke were doing with automatic font generation at Adobe. Earl Smith, the designer of the original Mac logic, was prevailed upon to create a controller to run Adobe's PostScript software, and the Apple LaserWriter was born. But Apple's management was not impressed, especially by the printer's hefty $7,000 price tag. It was the middle of the Lisa disaster (Apple's overpriced and underpowered precursor to the Mac), Belleville explains, and "they didn't want any products that were up near $10,000. I said, No, you don't understand, this isn't a computer. You put this in the dealer, you put the test software on a Mac, you push the button, out comes this beautiful page. And out comes the checkbook, I can guarantee you that."

No one believed him. "The LaserWriter project was killed at Apple once a month for two years," laughs John Moon, the manager Belleville hired to run the peripherals operation at Apple. At one stage in late 1983, even Jobs got cold feet, leaving Belleville as the only champion. "It was Bob who really kept the toothpaste in the tube," says Moon.

Apple launched the LaserWriter in 1985 – and fired Jobs and Belleville. Now at Silicon Graphics Inc., Belleville believes that the laser printer was *the* key part of the Macintosh package. "Apple Computer would be out of business if it hadn't been for the laser printer," he asserts. "The LaserWriter is what made the Mac, and it's what kept Apple afloat between the time they threw us out and the time they got completely weird."

The relationship between Apple and Canon was never as close as the one between Canon and Hewlett-Packard. Over the years, Apple and Canon have often wrangled over costs and delivery dates, with Canon refusing to waver from its basic philosophy that quality comes first. "That was the highest-order bit to them," says Moon, who recently left Apple to form an independent company, D'Ombre Systems. "They believed that if they had products of superior quality, the products would sell. To achieve that quality, their tactics were to invest in the basic technology."

By handing off the design of the formatter (a printer's higher-level electronics) and the marketing to customers like Apple and Hewlett-Packard, Canon has been able to focus on what it does best – making improvements to the machine. "If you don't keep mixing in new technologies with the ones you already have, then you can't stay ahead of the competition," says Takashi Kitamura, who after 21 years is still in charge of laser printer development at Canon. In recent years, Japanese rivals like Fuji, Xerox, and Ricoh have posed a challenge with their low-end laser engines, but Canon still owns more than 70 percent of the market. Since the engine typically accounts for half or more of the cost of a printer, this is lucrative. The laser printer market was worth $4.8 billion in 1993, according to International Data Corporation, which projects growth of 10 percent in 1994. (HP, which uses only Canon engines, has 55 percent of this market.)

The latest example of Canon's unending drive to stay ahead is a new printer engine that is the first to comply with US Environmental Protection Agency guidelines for energy conservation. In order to fuse toner to paper, laser printers eat loads of electricity, heating the aluminum roller that does the fusing (in some offices, the lights dim when the printer's on). But it's the energy printers use to keep the fuser warm while they stand idle – which is most of the time – that accounts for the bulk of their consumption. And before the printer can be used again, the fuser must still be heated up to fusing temperature, a process that typically takes from 30 seconds to a minute. Canon used a radical redesign to solve the problem. The basic idea is to dispense with the aluminum roller in favor of a small ceramic heater.

"Essentially, what Canon has done," comments Steve Myers, a Tokyo-based analyst with Jardine Fleming Securities, "is both to eliminate the need to keep the fuser continuously warm and dramatically shorten the time required to heat it."

The future for Canon's laser printer engine business would appear rosy, were it not for one very sharp thorn – exchange rates. The dollar continues to plummet in value against the yen – at the time of this writing, the rate was at a record low of US$1 to ¥97. "We can't raise our prices too much," says Kitamura, "so from a profit point of view, the current situation is very tough."

That much, at any rate, the business school professors should be able to understand. ■ ■ ■

Extropians

◄ 108 Still, for all their journals, newsletters, e-mail lists, and other forms of obsessive communication, it cannot be said that the Extropians are taking the world by storm. Although recent issues of *Extropy* have boasted print runs above 3,000 and are being carried by some newsstands, total membership in the Extropy Institute was only about 300 at the time of Extro 1, while roughly 350 were reading the e-mail list on a regular basis. But what the Extropians lack in numbers they make up for in sheer brains; at various times people like artificial intelligence theorist Marvin Minsky, nanotechnologist Eric Drexler, and USC professor Bart Kosko (of fuzzy logic fame) have been found lurking on extropians@extropy.org.

Drexler, indeed, is something of a patron saint among Extropians, the reason being that his books, *Engines of Creation* and *Nanosystems*, some members feel, chart the path to the Extropian future. Tiny robots working with molecules, the theory goes, will bring us extreme longevity (Drexler does not speak of "immortality"), health, wealth, and indefinite youth.

We can become whatever we want to be; that is the core of the Extropian dream. Of course, people have dreamed such dreams before. But suddenly, it's all possible. This is the age when you can finally do it.

No surprise then, that at the Extropian Banquet and Extropy Awards Ceremony, at Extro 1, Drexler emerged as star of the show. This was after Hans Moravec (father of the downloading idea) gave the keynote speech; after Romana Machado, in her leather gauntlets, enumerated "five things you can do to fight entropy now"; after Tom Morrow, the attorney, talked about private legal systems; and after Max More proposed his "epistemology for Extropians," according to which all doctrine, but *especially* Extropian doctrine, was to be considered forever open to inspection, criticism, and improvement.

After that it was trophy time. There at the front of the room, the banquet room of the Sunnyvale Sheraton, up on a sort of ceremonial altar-table, was a line of actual Extropian trophies. Designed by institute member Regina Pancake, they featured the Extropian starburst in a disk of clear Lucite set into a black plastic base. There was the Corporate Award, for example, "to a company engaged in extropically important activity and run in a way unusually conducive to individual incentive, ingenuity, and autonomy." And the winner was ... the Xerox Corporation.

And so on for six more awards, including, eventually, the award for Technical Achievement, which went to Drexler. He, for his part, confessed to a strong bent for Extropianism.

"I agree with most of the Extropian ideas," he said later. "Overall, it's a forward-looking, adventurous group that is thinking about important issues of technology and human life and trying to be ethical about it. That's a good thing, and shockingly rare."

So are these people crazy, or what? The question *has* occurred to them.

"I had a very interesting conversation with a mental health professional last week," said Dave Krieger. Krieger, director of publications for a software company, had been a technical consultant to *Star Trek: The Next Generation*.

"In preparation for the panel discussion, the one about warding off dogmatism, I'd given her a few issues of *Extropy*, including one that has the Extropian Principles in it, and I said, 'Look this over and tell me: Are we crazy? Is this a world view that you or your colleagues would consider to be insane? Or psychologically unhealthy? Or neurotic?'"

Well, not exactly. But, in fact, she couldn't really say one way or the other.

"She said that they encounter so many people with defeatist attitudes, the attitude that they can't change their lives and that they can't improve things, that she could see the benefits of Extropianism."

That was on the one hand. On the other hand, the whole thing was still pretty outlandish. "She didn't want to use the word 'receptive,'" said Krieger. "She didn't want to be quite that strong."

Others, however, were far less restrained. "They haven't convinced me that I'll be resurrected a thousand years from now – not that it matters" said Julian Simon, a University of Maryland economist who has written for *Extropy*. "But they sure are right about rejecting unimaginative and counterproductive notions of closed systems. Resources aren't 'finite' in any significant sense."

"They're extremists," said Marvin Minsky, about the Extropians. "But that's the way you get good ideas."

As it was, Minsky himself *almost* joined the institute. "I'd like to be a sustaining member," he told Max More. "The trouble is that since about 1970, when we got our first ArpaNet, I became almost unable to lick a stamp. I will, if necessary, but I'd rather phone you a credit card number." But the institute, unfortunately, had not quite gotten around to that.

It soon will, however. Extropy is an idea whose time has come.

"We see this need for transcendence deeply built into humanity," said Max More. "That's why we have all these religious myths. It seems to be something inherent in us that we want to move beyond what we see as our limits. In the past we haven't had the technology to do that, and right now we're in this difficult period where we don't quite have the technology yet, but we can see it coming."

And if the worst happens and you should die before the technology arrives, the plan is to put yourself on hold for the duration, which is why the major Extropians are signed up for cryonic suspension. Max More, Tom Morrow, Simon Levy, Dave Krieger, Romana Machado, Tanya Jones, Mike Perry – they're all ready to have their heads frozen when the time comes. Tanya Jones, indeed, jokes about having a dotted line tattooed around her neck, together with the words *cut here*.

And why not? How else to make it over the crest, over the slight hill rise, over the next little bit of technology that's left to climb before we can rush down the other side, to the new tomorrow, when all things will be possible? Some incredible things are going to be happening, if and when we get there.

"I enjoy being human but I am not content," said Max More.

Exactly! That was it! That was the secret, the big Extropian key to the universe: appreciate what you've got, but without being overly satisfied with it. There's always something better – *far* better! – waiting in the wings. You've just got to get yourself out there.

Who could deny it? And who'd not want to be there, in the grand future, when the VEPs, the Very Extropian Persons, wake themselves up, shake off the dust of past ages, and fly off to the far reaches of the galaxy?

You, too, could join the party – the Extropaganza Maximum! Just remember, when you get there, that it's ... right hand out in front of you, fingers spread and pointing at the sky. Grasp the other person's right hand, intertwine fingers, and close.

Then *zoom* your hand up, *straight* up, *all* the way up!

Upward! Outward! Reach for the stars!

"Yo!" ■ ■ ■

For more Extropian information, e-mail exi-info@extropy.org.

Mosaic

◂ 121 port, and none of the rewards. "It wasn't clear where we stood," Wilson says. "All of a sudden we were working for money, but it wasn't admitted we were working for money. There was a lot of discontent building up." By early 1994, Wilson had left the NCSA and joined SPRY.

Andreessen also left the NCSA, departing in December 1993 with the intention of abandoning Mosaic development altogether. He moved to California and took a position with a small software company. But within a few months he had quit his new job and formed a partnership with SGI founder Jim Clark.

"At the NCSA," Andreessen explains, "the deputy director suggested that we should start a company, but we didn't know how. We had no clue. How do you start something like that? How do you raise the money? Well, I came out here and met Jim, and all of a sudden the answers starting falling into place."

In March, Andreessen and Clark flew back to Illinois, rented a suite at the University Inn, and invited about half a dozen of the NCSA's main Mosaic developers over for a chat. Clark spent some time with each of them alone. By May, virtually the entire ex-NCSA development group was working for Mosaic Communications.

Andreessen answers accusations that corporate Mosaic Communications "raided" nonprofit NCSA by pointing out that with the explosion of commercial interest in Mosaic, the developers were bound to be getting other offers to jump ship. "We originally were going to fly them out to California individually over a period of several weeks," Andreessen explains, "but Jim and I said, Wait a second, it does not make much sense to leave them available to be picked up by other companies. So we flew out to Illinois at the spur of the moment."

Since Mosaic Communications now has possession of the core team of Mosaic developers from NCSA, the company sees no reason to pay any licensing fees for NCSA Mosaic. Andreessen and his team intend to rewrite the code, alter the name, and produce a browser that looks similar and works better.

The Anti-Gates

Clark and Andreessen have different goals. For Jim Clark, whose old company led the revolution in high-end digital graphics, Mosaic Communications represents an opportunity to transform a large sector of the computer industry a second time. For Andreessen, Mosaic Communications offers a chance to keep him free from the grip of a company he sees as one of the forces of darkness – Microsoft.

"If the company does well, I do pretty well," says Andreessen. "If the company doesn't do well" – his voice takes on a note of mock despair – "I work at Microsoft."

The chair of Microsoft is anathema to many young software developers, but to Andreessen he is a particularly appropriate nemesis. Andreessen believes that Mosaic could become the standard front end to the Net, a universal gateway to the entire stream of digital information. The young developer hopes that the momentum toward a global data environment will create an insatiable demand for Mosaic Communications's proprietary browser. Mosaic, in this scenario, is the DOS/Windows of cyberspace, an achievement that would make its young creators the new millennium's first computer zillionaires.

Of course, there are a few barriers standing in the way, not least of which is the real-life Bill Gates, who is hardly prepared to cede the field. Microsoft has its own ideas about the front end of the Net. Gates is working with cable mogul John Malone to design a set-top box that will control digital televisions attached to the coaxial wires owned by the cable industry. In the short term, Microsoft is casually announcing that the new version of its Windows operating system will be "Internet-ready, right out of the box." Such promises may be mere braggadocio, but the young Mosaic developers know that in leaving the world of the Internet and going after the desktop market they are poaching on the estates of powerful industry notables. When they describe the future of Mosaic, Bill Gates is never far from their minds. "Microsoft, what are they going to do?" asks Andreessen. "The moment Microsoft jumps in, the rules change."

At SPRY, Chris Wilson expresses a hope that the momentum of the Web will keep Microsoft at bay. "It could be that Microsoft is going to announce the release of something that has a completely different form of networking," he says. "It is theoretically possible that they could crush us all. But I doubt that. Right now the World Wide Web and Mosaic have so much steam built up."

What the Mosaic vendors have going for them, aside from the sheer appeal of their browser, are the established technical and philosophical tendencies of the network world. The popularity of the World Wide Web rests upon the way it satisfies the desire of individuals and groups to make their information universally available, while not imposing any single standard of hardware or software. Tim Berners-Lee, who helped create the Web, is now directing an international effort to extend the Web's capabilities while maintaining an open and platform-neutral environment.

Based on this open environment, developers around the world are working on some stunning enhancements to the Web, including better page-layout techniques; artificial-intelligence search engines; smart, distributed data-storage methods; and even interactive, Web-

More Information on Mosaic:

To get the individual version of Mosaic right now, go to the NCSA Mosaic anonymous ftp distribution site: *ftp.ncsa.uiuc.edu*. Program files are in directory /Mosaic.

Among the many companies offering SLIP or PPP connections are Performance Systems Inc., +1 (703) 709 0300; CRL, +1 (415) 837 5300; and Netcom On-Line Communications Services Inc., +1 (408) 554 8649.

For more information about getting a Net connection that supports Mosaic and other graphical WWW browsers, send e-mail to *info-rama@wired.com*, containing the line "send getting.wired" in the message body. The file will be returned to you automatically via e-mail. To stay abreast of goings-on at *HotWired*, *Wired*'s new WWW-based sister cyberstation, send e-mail to *info-rama@wired.com* containing the line "subscribe hotwired" in the message body. You will be added to an electronic mailing list that provides weekly updates on *HotWired*'s online activities.

based, virtual reality environments. David Raggett, who is on the technical staff of Hewlett-Packard's research labs in Bristol, England, and who is helping to develop the specifications for the next generation of Web documents, speaks of how the Web could accommodate the millions of new users expected to arrive in the coming months. He imagines the different computers on the Web sharing data in such a way that the most popular information is replicated onto many machines, while the least popular information lives on a single machine. Addresses, in the conventional sense, would disappear. No human being would know where any specific piece of information was stored. The Web would shift its data around automatically, while users could retrieve documents simply by knowing their names. The Web, in this scheme, becomes unlocatable and omnipresent.

At MIT, a researcher named John Mallery points out how primitive the Web's links are today. They are fun, he agreed, but they are not smart. You can find information on the Web only by drifting through the links other users have created or by knowing the specific address of the document. But if documents and parts of documents were catalogued in more complicated ways, the system itself could build links. Browsing a magazine on the Web might automatically generate links to other magazines. Looking at an archive of photographs of flowers might automatically create links to a botanical database. "With these kinds of systems," says Mallery, "the goal is referential integration. You've got all these people, and people are cultural – the individual has cultural software that he is running. As that culture is expressed electronically, you can integrate it into the Web. You can build a knowledge base that can draw on the experience of not just the individual or a limited group, but a whole country or planet." In Mallery's view, the Web is destined to become not only omnipresent, but also, in a sense, omniscient.

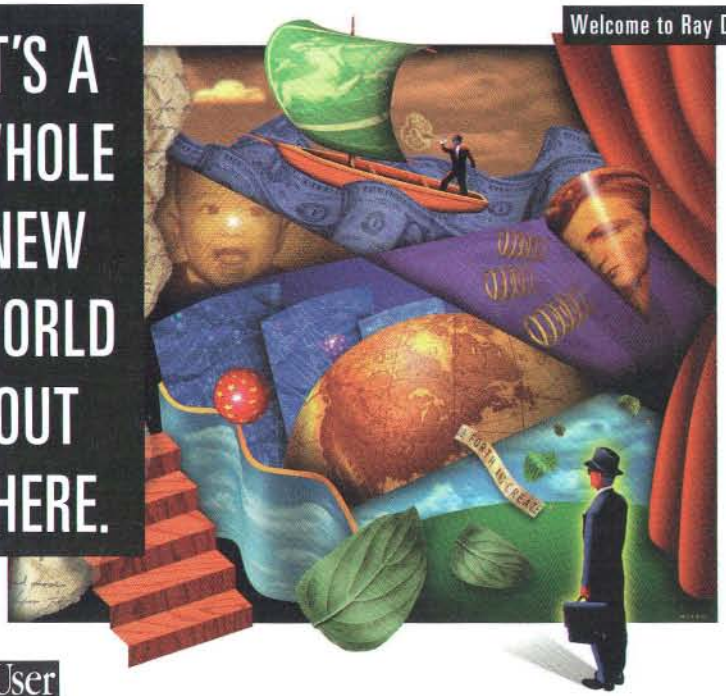
Perhaps the most intriguing experiment in Web development is the attempt to create a standard for interactive, virtual-reality environments. According to Hewlett-Packard's Raggett, some of the elements, such as giving a 3-D view and allowing movement and interactivity (for instance, clocks that tick louder as the user approaches), require surprisingly little bandwidth. And there is an ongoing effort to develop practical, present-day virtual reality tools. (For more information, visit *http://www.wired.com/vrml/*.) "The approach we are taking now," Raggett says, "is to keep it simple. Get some simple virtual-reality browsers out there. That will motivate people and begin to create opportunities."

"The overriding danger to an open standard is Microsoft," Andreessen says. "One way or another, Mosaic is going to be on every computer in the world."

The Commercial Conundrum

Interestingly, at the practical level of commercial Mosaic development, both Wilson and Andreessen expressed doubt about whether the World Wide Web can maintain its open yet unified environment. To keep the Web from fragmenting into

IT'S A WHOLE NEW WORLD OUT THERE.



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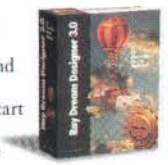

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RAY DREAM

Mosaic

smaller communities with more rigid technical requirements, the authors of Web tools will have to share their ideas and coordinate the development of new standards. This is fine in the nonprofit research and academic worlds. But in the private sector, coordination could mean a sacrifice of competitive advantage. Mosaic Communications could hardly become the DOS of cyberspace if it developed its product in a way that encouraged competition from scores of other more or less interchangeable Mosaic browsers. Mosaic Communications has figured this out, which may be why Andreessen no longer shares much information with his colleagues outside the company.

"At this point I see a lot of fragmentation," Wilson complains. "We are forging ahead in areas that need guidance – in security for instance. That is going to take a lot of standards work. I would like to see what happens with the other companies, and with Mosaic Communications especially. I haven't heard a lot from them."

HOTWIRED

Gary Wolf will appear in the Wired Auditorium on America Online to discuss Mosaic and the World Wide Web on October 12 from 9 p.m. to 10 p.m., Eastern Daylight Time (6 p.m. to 7 p.m., Pacific Daylight Time). From AOL type the keyword *wired* and click on the Wired Auditorium icon.

The reason Wilson and other Mosaic developers have not heard much from Mosaic Communications lately, Andreessen admits, is that a unified standard is not of first importance to the company. "Our major concern is our products," he says. "On top of that, we would like to be in an open environment, where other browsers could read our documents. It makes companies and consumers more willing to buy in. But it can't be our primary concern.

"We are not going to let it slow us down," he continues. "If we are moving faster than everybody else, then we will simply publish what we have done. We will say, 'This is how it is done, this is how you write documents to it.' We will have our implementation out there, and we will be competing on the basis of quality."

As we talk, I sense that Andreessen anticipates that other Mosaic developers will be irritated by his approach. The reason is obvious: if Mosaic Communications releases a stunning version of Mosaic and everybody begins to use it, and if the new version or a later upgrade is not compatible with competing Web browsers, then the rest of the Mosaic companies are going to have to get in step with Mosaic Communications or go out of business. Mosaic Communications is going to be in the position of setting the standards. This top-down approach to standards development is well known: it's the Microsoft model. Andreessen admits that it does not always lead to the most logical standards or the best products. He pauses to tell a well-known Microsoft joke: "How many Microsoft engineers does it take to change a light bulb? None, they just declare darkness the standard."

Of course, a top-down effort to define the standards of the Web may simply fail. Most Web developers I spoke with seemed to think that Mosaic Com- 154 ►

The Rush to Commercialize: Companies Holding Licenses to NCSA's Mosiac

Amdahl Corporation
1250 East Arques
Sunnyvale, CA 94088-3470
Contact: Steve Telleen
Phone: +1 (408) 992 2693
E-mail: *slt50@oes.amdahl.com*
Product: Not announced.

Fujitsu Limited
17-25, Shinkamata 1 - Chome
Ota-ku
Tokyo 144, Japan
Contact: Yasuyo Kikuta
Phone: +81 (3) 3730 3174
Fax: +81 (3) 3735 4240
E-mail: *kikuta@aisys.se.fujitsu.co.jp*
Product: Infomosaic, a Japanese version of Mosaic.
Price: ¥5,000 (approx US$50).

InfoSeek Corporation
2620 Augustine Drive, Suite 250
Santa Clara, CA 95054
E-mail: *info@infoseek.com*
Product: No commercial Mosaic. May use Mosaic as part of a commercial database effort.

Quadralay Corporation
8920 Business Park Drive
Austin, TX 78759
Contact: Brian Combs
Phone: +1 (512) 346 9199
E-mail: *INFO@quadralay.com*
Product: Consumer version of Mosaic. Also using Mosaic in its online help and information product, GWHIS.
Price: US$249.

Quarterdeck Office Systems Inc.
150 Pico Boulevard
Santa Monica, CA 90405
Contact: Robert Kutnick
Phone: +1 (310) 314 4263
Fax: +1 (310) 314 4218
E-mail: *bob@qdeck.com*
Product: Not announced.

The Santa Cruz Operation Inc.
400 Encinal Street
Santa Cruz, CA 95060
Phone: (800) 726 8649;
+1 (408) 425 7222
E-mail: *info@sco.com*
Product: Incorporating Mosaic into "SCO Global Access," a communications package for Unix machines that works with SCO's Open Server. Runs a graphical e-mail service and accesses newsgroups.
No separate price.

SPRY Inc.
316 Occidental Ave. South, Suite 200
Seattle, WA 98104
Phone: (800) 777 9638;
+1 (206) 447 0300
E-mail: *info@spry.com*
Products: A communication suite: Air Mail, Air News, Air Mosaic, etc. Also producing Internet In a Box with O'Reilly & Associates.
Price: US$149-$399 for Air Series.

Spyglass Inc.
1800 Woodfield Drive
Savoy, IL 61874
Phone: +1 (217) 355 6000
Fax: +1 (217) 355 8925
E-mail: *info@spyglass.com*
Product: Relicensing to other vendors. Recently signed deal with Digital Equipment Corp., which will ship Mosaic with all its machines.

* * ** * ** * ** * ** * *

NCSA Information:
Software Development Group
National Center for Supercomputing Applications, University of Illinois, Urbana-Champaign
Contact: Jae Allen
Phone: +1 (217) 244 3364
E-mail: *jallen@ncsa.uiuc.edu*

Mosaic Communications Corp.
650 Castro Street, Suite 500
Mountain View, CA 94041
Contact: Rosanne Siino
Phone: +1 (415) 254 1900
E-mail: *info@mcom.com*
WWW: http://mosaic.mcom.com

INTERNET
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On-Line is not the Internet.

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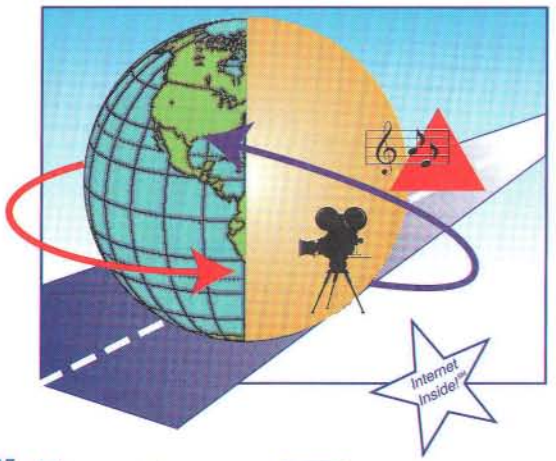

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Mosaic

◄ 152 **munications was taking the wrong approach. They were confident that better browsers than Mosaic would be released in short order, and any temporary benefit Mosaic Communications gained from hiring so many developers from the NCSA would quickly disappear as more and more people got into the game.**

As I reviewed my notes from interviews with Andreessen, I was struck by the thought that he may have conjured the Bill Gates nemesis out of the subtle miasma of his own ambivalence. After all it is *he*, not the programmers in Redmond, Washington, who is writing a proprietary Web browser. It is he, not Bill Gates, who is at the center of the new, ambitious industry. It is he who is being forced by the traditional logic of the software industry to operate with a caution that verges on secrecy, a caution that is distinctly at odds with the open environment of the Web.

When I ask Andreessen about how Mosaic Communications's Mosaic will reach consumers, he will not answer directly. He makes it clear that his company does not intend to put a shrink-wrapped product on the shelves. He implies that Mosaic Communications's Mosaic will be licensed and shipped with "Internet-ready" computers and operating systems. But if Andreessen wants to get Mosaic onto the desktop in this manner, then the partnership choice is obvious. Would Mosaic Communications do a deal with Bill Gates?

Marc Andreessen isn't telling. "The overriding danger to an open standard is Microsoft," he says. But at the end of our interview, while we are still dancing around the marketing question, Andreessen attempts to resolve it by simply stating his ambition. "One way or another," he says, "I think that Mosaic is going to be on every computer in the world."

I wait for more.

"One way or another," he repeats. ■ ■ ■

Clark

◄ 119 loses its founders. I think it was bad when Steve Jobs left Apple. If Steve had done the NeXT product inside Apple, it would have been wonderful. But he was going against the grain when he was doing it outside of Apple. Just as I would if I had left SGI and started another graphics workstation company. If I had gone down the road of trying to make this chip and do a PC with advanced graphics, it would have been a real struggle, because I would have been going against the whole culture over there. Right now no one over there has anything against me. I'm not trying to hurt them. None of this is aimed at hurting; it's more just observation.

You're known for speaking your mind. You've made comments about Apple and Trip Hawkins and IBM –

What I said about Apple was that they made a serious mistake by not capturing something else besides user interface stuff and trying to protect that when, in fact, Steve Jobs copied that from Xerox. He had no patent. And had Jobs been there, he'd have been pushing them to create something new, rather than trying to protect their current territory. Apple circled the wagons around GUI, and that was the wrong thing to do. GUI wasn't protectable. Rather than creating a new thing like the NeXT box and like object-oriented programming or any of that kind of stuff, they circled the wagons. Later they started to make notebooks, that was a good thing. And what I said about Trip Hawkins was that he was hyping the 3DO player too much. I still believe that Trip got way out ahead of himself. He basically started believing all of the things he was saying. He complains about me in some recent article, "I didn't ever do anything to Jim Clark." No, he didn't ever do anything to me except he trivialized 3-D. Claimed it was easy. It isn't trivial. It's hard to do. It's hard to pull off all those tricks with smoke and mirrors. So he trivialized it, and I think it's going to catch up with him. He made the world believe he was going to deliver 3-D for $500 to $600. And I don't think he will. No, I don't think I've gotten myself in trouble.

Why Mosaic?

Mainly because I ran into Marc Andreessen immediately upon leaving SGI, and Marc was the author of Mosaic. The original thought was to go into interactive television in some fashion. But what is Mosaic? A navigator for interactive stuff on a network. The network happens to be called the Internet, but the physical network is slowly improving in bandwidth and someday it will be capable of carrying video. The slope of growth of the television industry is zero. It's even negative. Television doesn't change. Cable is nothing but an overlay of a physical delivery scheme for broadcast television that has been around for 40 years. There's no two-way interactivity, nothing. So I began to think about the difficulties of the transition of the cable industry into interactivity. It's a completely daunting task. First of all, you have to cause the television industry to get accustomed to digital technology, which is a major change. Then it has to think of two-way interactivity, which is a major change. And it has to make the physical network carry switched-video capability. That's just a whole group of major changes.

That's not even talking about the consumer.

Right. People don't have problems with interactivity on computers. More and more, computers are being built so you can see video on them. You look at those dynamics, and you look at the dynamics on the other side of the ledger, and you say, What are you doing over here? Get over there.

I'm sure you've followed all the concern about the coming commercialization for the Internet.

That to me is peculiar. When the phone system was invented it was primarily for voice. We commercialized it when we began to use it for business, and we commercialized it further when we began to do data transfers over the wire, money transfers over telephone lines. It's exactly the same thing. Commercialization of the Internet is as inevitable as the sun coming up tomorrow.

While heading SGI you came to believe that the future lies in interactive TV. You made the deal with Time Warner for servers and set-top boxes. This is a big change.

Tele-Communications Inc. is a great company. But it represents a blockage in the system because it doesn't have the bandwidth to deal with all the deals. If I'm sitting here waiting to do a deal with the cable industry, I have to do it with Time Warner or TCI. And that's just too small a market. I'd rather deal with something that's more organic, that has lots of ways you can get into it. That's how I view the Internet. Even by the end of the year, based on current growth rates, the total number of users on the Internet is going to be as big as cable. US cable serves 60 million homes; we're currently at 25 million Internet users. By the end of the year, that will be 50 million. By the middle of next year, you'll be over and above what US cable operations touch. It's a big market, and no single entity is in control of it. It's much more organic and grassroots, which I find appealing.

Ten years from now, are movies-on-demand going to come in over the Internet to computers?

I think what you call a computer today will mutate. A stripped-down version of today's computer will be used as an interface to a television. The television display will become higher quality. The television display will be able to display text. In other words, it will look like a computer screen. So the television as we know it 156 ►

COMING SOON:

HOTWIRED

New thinking for a new medium

"It's filtered."

Clark

◄ 154 goes away. And now the ordinary consumer says, Well it's a better-looking picture, and I've got this different remote, and I can point to things on the screen, and it's a higher-quality picture. But I can watch movies and see video – ordinary television.

That kind of user you could call the couch-potato user. Meanwhile, there are the 25 million plus with computers. Even the average person who uses a computer is sophisticated, compared to the couch-potato user.

And that audience is growing every day. The cable industry, or traditional television, counts on the stupidity of the consumer. The PC counts on the intelligence of the consumer. But the point is, even a nonliterate person will be able to use what the PC becomes, because when you remove the keyboard and put a big display on it, you have television, but you also have computing. You have things that you associate with a computer today. Those things you traditionally associate with each medium are going to come together, and I think they're going to come together with the center of gravity around computing, not around the old television technology. When you change the entire screen, the entire analog system to digital, the underlying broadcast to an interactive schema, you have computing, not television. So the computer becomes a TV, rather than the TV becoming the computer. Maybe the flaw in my thinking was that I felt television and the cable industry could move quickly. I thought they could. I was wrong. I don't believe they can. The rate at which cable can change the installed plant doesn't compare to the rate at which computing technology is going to become a television.

How did you conclude that?

Well, I wasn't allowed to come to that conclusion when I was the chair of SGI. I couldn't say, Let's take our technology and become a PC. That would have meant taking the MIPS machine and building a PC out of it. That means that you can't add any value because the people in Redmond, Washington, determine the flow at which you can add value or add capability to DOS and Windows. Those are the constraining things. They constrain that market.

Do you think Time Warner and TCI and the others are wrong about the infohighway? Are their tests going to fail?

If they wanted to be successful, they would have had to act in unison. Time Warner and TCI had to say, We hereby endorse this thing. Had they said that, the whole world would have focused behind it. Everyone would have started applying intense energy into making it low cost, et cetera, et cetera. But Time Warner and TCI couldn't see eye-to-eye. I tried my best. Even with complete unison they would have had to run like hell, because the computing industry is changing in a nonstop way for many, many more years.

Has Malone actually spent a day on the Internet?

I don't know. Malone is a very smart guy. He'll pick up on this very quickly. I just don't think he's figured out yet how to leverage his current holdings, a combination of content via Liberty Media and the wire business, into this new area. By the time they get interactive switched-video circuits, the Internet will have scaled into something that can do the same thing. Or the Internet will be able to ride on top of it. The way to think of the Internet then is a protocol riding on top of whatever physical network is there.

Would it be difficult if, right now, he wanted to put computers on his cable systems?

He could offer Internet access right now. Intel has just introduced a modem to let anybody connect a PC to the cable. They fully intend to do that. The fascinating thing is, once they get there, how do they control the content?

They can't.

So they become a utility. A data-carrying utility.

Look down the road 15 years: what's coming?

Fifteen years is adequate time to have lightweight portable things that give you most of the media you want to read or view. The notion of media will be completely blended in one digital stream. Moving pictures and static pictures and text and audio – the mix of any of those will be commonplace. Imagine turning the pages of a magazine: every one of the images is a sound clip, and when you put your cursor over one of them, the audio comes. That's absolutely going to be happening in 15 years. Full convergence of media and television and computers.

Do big companies dominate?

I don't have any way to predict that. If they act properly, they can. If I were Sony, just to give you an example, I would be acquiring more software. Not content, but more underlying software. Because software is where the added value is going to be, and they're not acquiring any. There's a layer of software that's enabling, that connects content to hardware, that they don't know anything about.

If you had to start a hardware company, what would you do?

I've got an idea there, but I'm not going to start a hardware company. I would build an extremely inexpensive box that connected to cable television and that had enough power to take in decoded video signals and programmability and the ability to run Mosaic. Now, such a box could be built today for very little cost. I think what I'm talking about is what the set-top box should become. But whether it will is a completely open issue.

Is it true that you were unfamiliar with the Internet until recently?

That was a misinterpretation. Of course I knew what the Internet was. But I hadn't thought about what the implications were in terms of its growth rate. The Internet is a protocol running on top of a physical connection network. That underlying physical network can be changed and the protocol can still be called the Internet. As the underlying physical network changes, all of these applications you develop for the Internet port right over there. You would be astounded at the number of terabytes of data that are served by Mosaic today, daily, running on numerous platforms. It's sort of the standard network tool.

What are you going to do with it? Right now it's available for free.

It's like saying you get 1.0 for free. What about 2.0? Do you want it? Of course you want the upgrades and the new features. So the first release was free. Second release? Depends on how we structure it. It's a new game, and we're going to build a business around it.

How long before a commercial version will be available with security ad billing?

Six months to a year. Actually, it will be later this year.

You started SGI with half a million dollars and six students and turned it into a billion-dollar company. Can you do it again?

I'm relying on Andreessen to strike fire the second time. The vision is really Marc Andreessen's, not mine. And I think he can strike fire the first time. He kind of struck it already, and now he's going to do it in a commercial sense. ■ ■ ■

Michael Goldberg (insider@netcom.com) *profiled CamNet in* Wired *2.09*).

Cable is nothing but an overlay of a physical delivery scheme for broadcast television that has been around for 40 years.

Colophon

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Message 16:
Date: 10.1.94
From: Nicholas Negroponte
<nicholas@media.mit.edu>
To: Louis Rossetto <lr@wired.com>
Subject:

Sensor Deprived

Proof of Presence

When it comes to sensing human presence, computers aren't even as talented as those modern urinals that flush when you walk away. You can lift your hands from a computer's keyboard (or even between keystrokes) and your computer does not know whether the pause is for momentary reflection, or for lunch. We give a great deal of attention to human interface today, but almost solely from the perspective of making it easier for people to use computers. It may be time to reverse this thinking and ask how to make it easier for computers to deal with people.

A recent Media Lab breakthrough by Professor Neil Gershenfeld solves a range of user interface problems with a few dollars of hardware. A varying electric field induces a small (nanoamp) current in a person that can be measured to locate the person in the field, making it is possible to build smart appliances and furniture that remotely and unobtrusively locate fingers or hands in 2-D or 3-D, bodies in chairs, or people in rooms.

Your face is your display device; it makes no sense for the computer to remain blind to it.

Another way for computers to sense human presence is through computer vision – giving machines the ability to see. Companies like Intel are now manufacturing low-cost hardware that eventually will lead to an embedded video camera above the screen of almost every desktop and laptop computer. This makes it possible for humans to telecommute and to collaborate visually from a distance. The computer could use that same camera to look at its user.

Furthermore, machine vision could be applied to sensing and recognizing smiles, frowns, and the direction of a person's gaze, so that computers might be more sensitive to facial expression. Your face is, in effect, your display device; it makes no sense for the computer to remain blind to it. I am constantly reminded of the tight coupling between spoken language and facial expression. When we talk on the telephone, our facial expressions are not turned off just because the person at the other end cannot see them. In fact, we sometimes contort our faces even more to give greater emphasis and prosody to spoken language. By sensing facial expressions, the computer could access a redundant, concurrent signal that enriches the spoken or written message.

Of Mice and Men

A mouse is one of the most absurd input devices. "Mousing around" requires four steps: 1) moving your hand to find the mouse, 2) moving the mouse to find the cursor, 3) moving the cursor to where you want it, and 4) clicking or double-clicking the button. Apple's innovative design of the new PowerBooks at least reduces these steps to three and has the "dead mouse" where your thumbs are anyway, so that typing interruptions are minimized.

Where mice and trackballs really fall apart is in drawing. I defy you to sign your name with a trackball. This is where tablet technology, which has been moving more slowly down the cost-reduction curve, plays an important role. Nonetheless, few computers have a data tablet of any sort. Those that do present the problem of situating the tablet and keyboard, both of which compete for centrality, near the display. The clash is usually resolved by putting the keyboard below the display because only a few people touch type.

High-Touch Computing

The dark horse in graphical input is the human finger. This is quite startling, considering the human finger is a device you don't have to pick up. You can move gracefully from typing (if typing has grace) to pointing, from horizontal plane to vertical. Why hasn't this caught on? Some of the limp excuses follow:

• You occlude that which is beneath your finger when you point at it. True, but that happens with paper and pencil, as well, and has not stopped the practice of handwriting or of using a finger to identify something on hardcopy.

• Your finger is low resolution. False. It may be stubby, but it has extraordinary resolution when the ball of the finger tip touches a surface. Ever so slight movement of your finger can position a cursor with extreme accuracy.

• Your finger dirties the screen. But it also cleans the screen. One way to think about touch-sensitive displays is that they will be in a kinetic state of more or less invisible filth, where clean hands clean and clammy ones dirty.

The real reason for not using fingers is, in my opinion, quite different. With just two states – touching or not touching – many applications are awkward at best. Whereas, if a cursor appeared when your finger was within, say, a quarter of an inch of the display, then touching the screen would be like the multi-states of a mouse click or data tablet. With such "nearfield" finger-touch, I promise you, we would see many touch-sensitive displays.

Eyes as Output

Eyes are classically studied as input devices. The study of eyes as output is virtually unknown. Yet, if you are standing 20 feet away from another person, you can tell if that person is looking right in your eyes or just over your shoulder – a difference of a tiny fraction of a degree. How? It surely isn't trigonometry, wherein you are computing the angle of the other person's pupil and then computing whether it is in line with your own gaze. No. That would require unthinkable measurement and computation. There is some kind of message passing, maybe a twinkle of the eye, which we just don't understand.

We constantly point with our eyes and would find such computer input valuable. Imagine reading a computer screen and being able to ask: What does "that" mean, Who is "she," How did it get "there?" "That," "she," and "there" are defined by your gaze at the moment, not some clumsy elaboration. It makes perfect sense that your question concerns the point of eye contact with the screen and, to reply, the computer must know the precise point. In fact, when computers can track the human eye at a low cost, we are sure to see an entire vocabulary of eye gestures. When that happens, human-computer interaction will be far less sensor deprived and more like face-to-face communication, and be far better for it.

Next issue: Digital Etiquette

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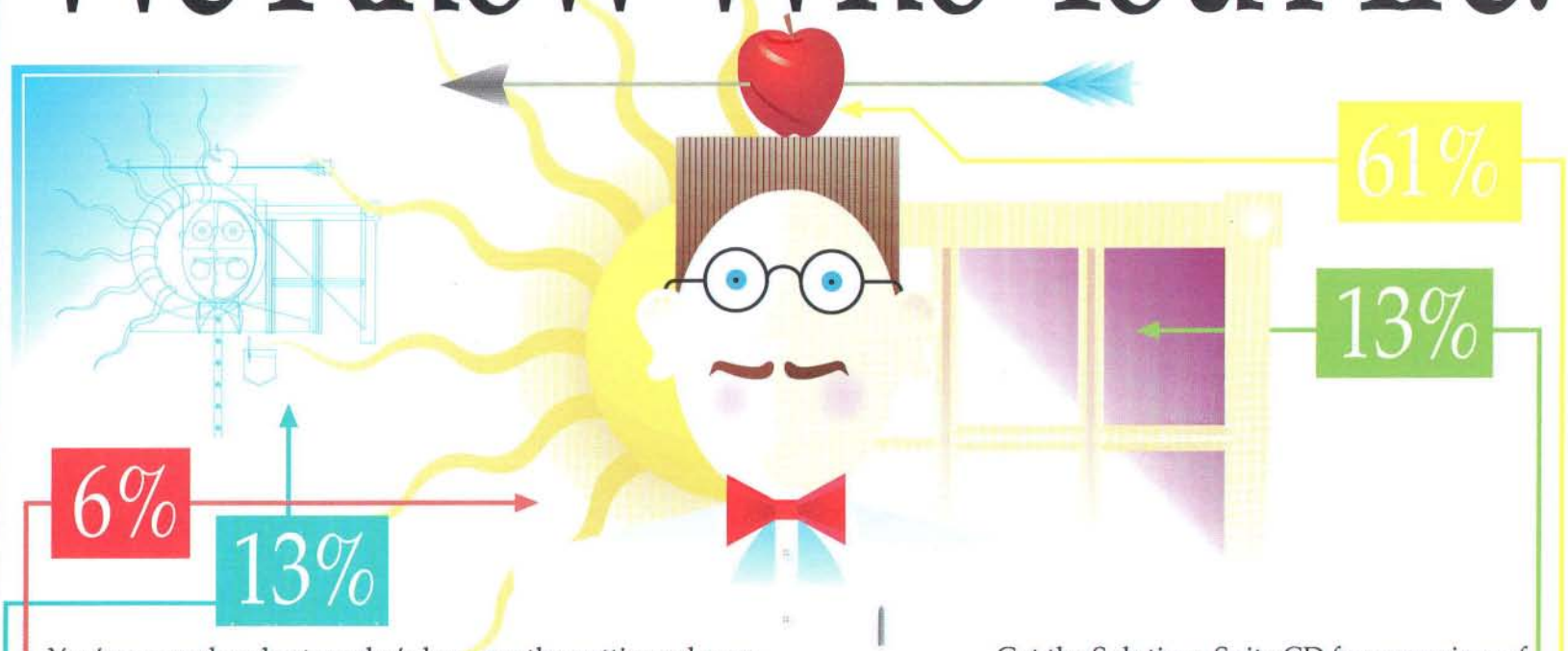

You're an early adopter who's been on the cutting edge so long it feels dull. You learned long ago that the network is the computer. Now you'd like just one computer on your desktop—or at least a unifying graphical user interface for the computers you have. You want insanely great apps and power development tools to "roll your own."

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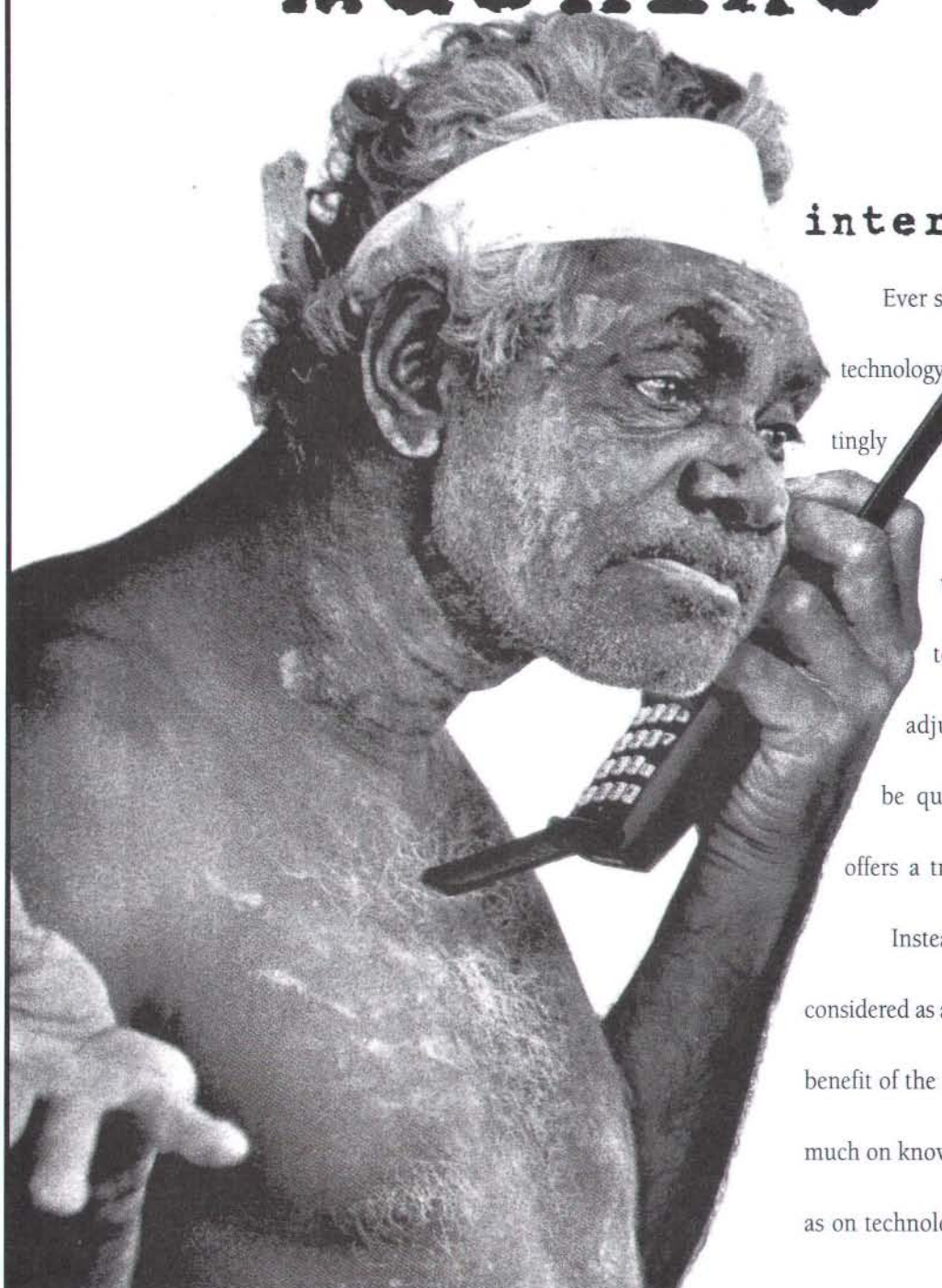
It's not that man the machine, machine should



7. Thoughts on international business.

Ever since the industrial revolution, man has allowed technology to push him to such extremes that he has unwittingly become a slave to his own inventions.

Entire companies were organized as if the people were mere cogs in a machine. We have since come to realize that equipment that requires extreme adjustment on the part of the user must actually still be quite primitive. And that adapting machine to man offers a tremendous challenge.

Instead of being seen as a Holy Grail, the computer is now considered as an auxiliary tool and a means of communication for the benefit of the user. More and more the art of automation focuses as much on knowing how to deal with people and corporate processes as on technology. And more and more automation is being judged

should understand it's that the understand man.

on its capacity to function with respect for the people working with it. Which is exactly as it should be.

That's why we consider ourselves fortunate that right from the start, some twenty years ago, we have placed the human condition at the very heart of our ideas about automation and organization. And that we have always sought to accomplish growth in the form of a chain of independent outlets responsible for their own affairs, and having their own targets to achieve.

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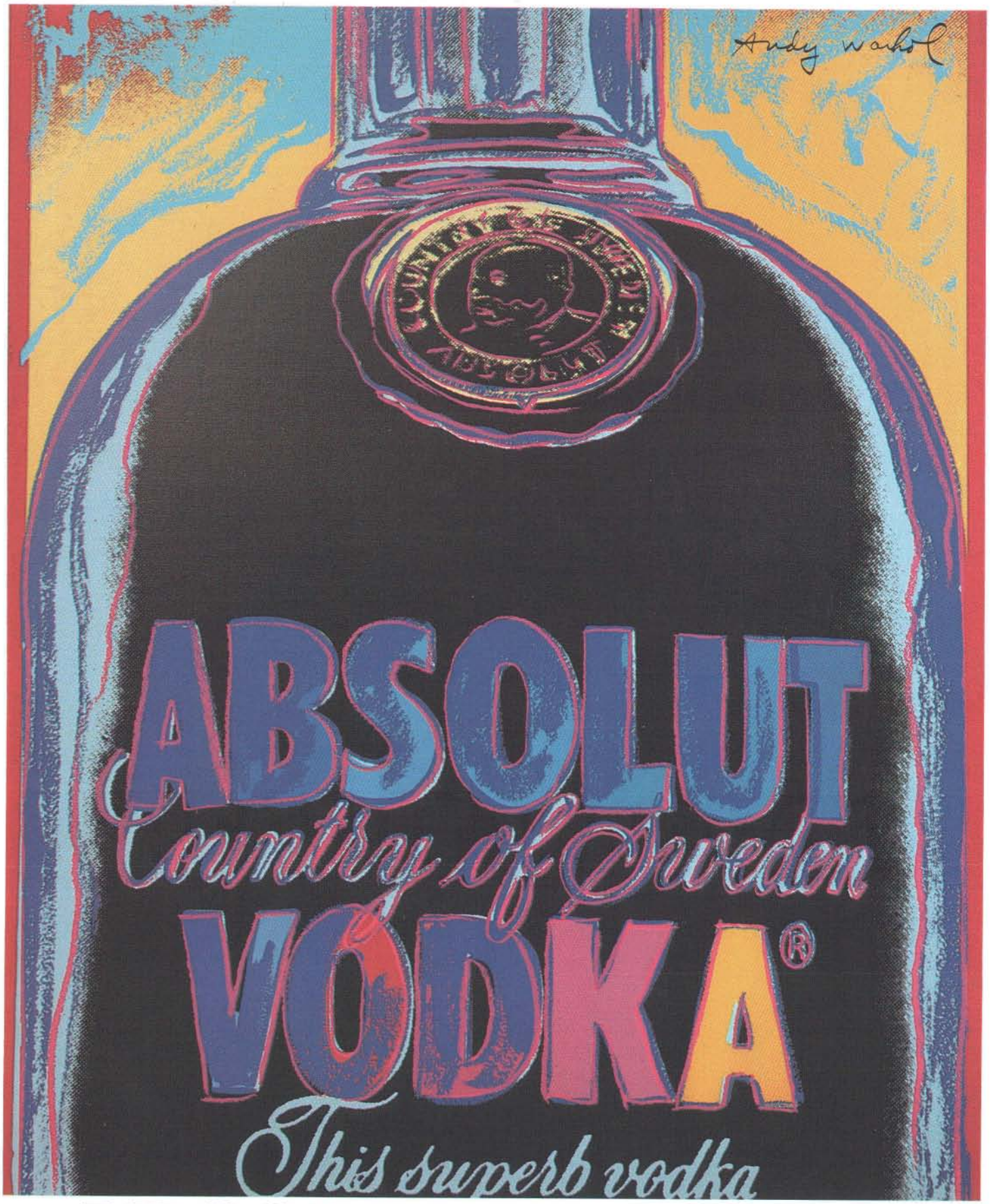

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